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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
Bulletin 125

NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA

BY

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AND

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ADVERTISEMENT.

The scientific publications of the United States National Museum consist of two series, the *Proceedings* and the *Bulletins*.

The *Proceedings*, the first volume of which was issued in 1878, are intended primarily as a medium for the publication of original, and usually brief, papers based on the collections of the National Museum, presenting newly-acquired facts in zoology, geology, and anthropology, including descriptions of new forms of animals, and revisions of limited groups. One or two volumes are issued annually and distributed to libraries and scientific organizations. A limited number of copies of each paper, in pamphlet form, is distributed to specialists and others interested in the different subjects as soon as printed. The date of publication is printed on each paper, and these dates are also recorded in the tables of contents of the volumes.

The *Bulletins*, the first of which was issued in 1875, consist of a series of separate publications comprising chiefly monographs of large zoological groups and other general systematic treatises (occasionally in several volumes), faunal works, reports of expeditions, and catalogues of type-specimens, special collections, etc. The majority of the volumes are octavos, but a quarto size has been adopted in a few instances in which large plates were regarded as indispensable.

Since 1902 a series of octavo volumes containing papers relating to the botanical collections of the Museum, and known as the *Contributions from the National Herbarium*, has been published as bulletins.

The present work forms No. 125 of the *Bulletin* series.

William deC. Ravenel,
Administrative Assistant to the Secretary,
In charge of the United States National Museum.

Washington, D. C., May 14, 1923.

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[1] The 47 plates of this volume, with their accompanying explanations, begin on page 245.

NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

By Ferdinand Canu,
Of Versailles, France,
and
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Of Washington, District of Columbia.

INTRODUCTION.

The present volume contains the results of researches upon the Post-Oligocene fossil bryozoa of North America and forms the concluding part of our studies upon the Tertiary and Quaternary faunas, those of the Eocene and Oligocene epochs having been published in 1920 under the title of North American Early Tertiary Bryozoa.[1] The present work, like the companion volume on the Early Tertiary faunas, was undertaken under the joint auspices of the United States Geological Survey and the United States National Museum. Almost without exception all the type specimens described and illustrated in the present volume are contained in the paleontological collections of the United States National Museum.

The authors are deeply indebted to Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, and Mr. W. deC. Ravenel, Administrative Assistant in charge United States National Museum, who have arranged for the publication of the work and have extended various courtesies to us during its preparation. Dr. T. Wayland Vaughan, of the United States Geological Survey, has likewise spared no effort in assisting us to bring the work to a successful conclusion and we are greatly indebted to him, as well as to other members of the Federal Survey, particularly Mr. Wendell C. Mansfield, Mr. R. D. Mesler, and Mr. I. B. Milner.

We are under many obligations to Mr. F. Julius Fohs, chief geologist of the Humphreys Mexia Oil Company at Mexia, Texas, who has very generously assisted us financially in the preparation and illustration of the volume, and who has thus shown his appreciation of the value of the bryozoa in stratigraphic and economic work.

Through several grants from the Marsh Fund of the National Academy of Sciences and from the American Association for the Advancement of Science we have been able to carry on supplementary studies of other fossil and recent bryozoan faunas which were quite necessary in the preparation of this volume. For this assistance we are highly grateful, as we have thus been enabled to pursue our researches on a larger scale and to secure more definite and lasting results.

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[1] Bulletin 106, U. S. National Museum, 2 vols., 879 pp., 162 pls.

Our hearty thanks are due to Dr. F. C. Clark, of Los Angeles, California, and Dr. Ralph Arnold, of Pasadena, California, who have supplied us with practically all of the faunas described from the Pleistocene of California.

The methods of study of the bryozoa and various other subjects relating to them in general have been described in our Early Tertiary volume, to which the reader is referred. We have, however, added to the present volume a bibliography of bryozoan literature published since 1899, the list of literature up to this date being contained in the work by Nickles and Bassler of 1900.[2]

Although the present work deals primarily with North American Post-Oligocene fossil Bryozoa, the descriptions of a few small faunas from the Oligocene rocks of the West Indies and of several miscellaneous Eocene species are added for various reasons.

CATALOGUE OF PAPERS OF AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

[A few papers by Canu, Ulrich, and Bassler, published since 1900, are not listed here because their contents are reproduced in the present work.]

1841.

Conrad, T. A. Observations on the Secondary and Tertiary formations of the southern Atlantic States, by James T. Hodge. With an appendix by T. A. Conrad. (Amer. Journ. Sci., ser. 1, vol. 41, 1841, pp. 344–348.)

The bryozoa in the paper are:

Lunulites denticulata, p. 348.
Lunulites depressa, p. 348.

1845.

Lonsdale, William. Report on the Corals from the Tertiary formations of North America. (Quart. Journ. Geol. Soc. London, vol. 1, 1845, pp. 495–509.)

Heteropora? tortilis, new species, p. 500. Miocene: Williamsburg, Petersburg.
Escharina tumidula, new species, p. 502. Miocene: Petersburg.
Lunulites denticulata Conrad, p. 503. Miocene: Petersburg.
Cellepora informata, new species, p. 505. Miocene: Petersburg, Virginia.
Cellepora umbilicata, new species, p. 507. Miocene: Petersburg.
Cellepora quadrangularis, new species, p. 508. Miocene: Williamsburg, Evergreen.
Cellepora similis, new species, p. 509. Miocene: Williamsburg.

1855.

Conrad, T. A. Note on the Miocene and Post-Pliocene deposits of California, with descriptions of two new fossil corals. (Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1855, p. 441.)

Idmonea californica, p. 441. Miocene: Santa Barbara, California.
Lichenopora californica, p. 441. Miocene: Santa Barbara, California.

1857.

Tuomey, M., and Holmes, F. S. Pleiocene Fossils of South Carolina. Charleston, 1857, xvi+152 pp., 30 pls.

The bryozoa are:

Lunulites denticulata Conrad, p. 11, pl. 4, figs. 1–5. Darlington district, South Carolina.
Cellepora tessellata, new species, p. 13, pl. 4, fig. 7. Giles Bluff, Peedee River.
Cellepora radiata, new species, p. 13, pl. 4, fig. 8. Smith's, Goose Creek.
Cellepora depressa, new species, p. 14, pl. 4, fig. 9. Smith's, Goose Creek.
Membranipora lacinia, new species, p. 14, pl. 4, fig. 10. Smith's, Goose Creek.

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[2] A Synopsis of American Fossil Bryozoa, including Bibliography and Synonymy. Bull. No. 173, United States Geological Survey.

Reptocelleporaria informata (Lonsdale), p. 15, pl. 4, figs. 11, 12. Darlington district.
Reptocelleporaria similis (Lonsdale), p. 16, pl. 4, figs. 13, 14. Darlington district, South Carolina; Petersburg, Virginia.
Heteropora tortilis Lonsdale, p. 16, pl. 4, figs. 15, 16. Smith's, Goose Creek.

1858.

Emmons, Ebenezer. Report of the North Carolina Geological Survey. Raleigh, 1858. Paleontology, pp. 193–314.

Lunulites denticulata, p. 311, figs. 248, 249. Miocene: Beds on Neuse and Cape Fear rivers.
Lunulites oblongus, new species, p. 312, figs. 252, 253. Locality not given.
Discoporella umbellata, p. 312, figs. 254, 255. Locality not given.

1860.

Holmes, Francis S. Postpliocene fossils of South Carolina. Charleston, 1860. xii+v+122 pp., 28 pls.

The bryozoa described are:

Reptocelleporaria informata (Lonsdale), p. 6, pl. 1, fig. 5. Charleston, South Carolina.
Lunulites denticulata Conrad, p. 6, pl. 2, figs. 4–4*b*. Simmons'; Abbapoola; St. Andrew's.

1862.

Gabb, William M., and Horn, George H. Monograph of the fossil Polyzoa of the Secondary and Tertiary formations of North America. (Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 5, 1862, pp. 111–178, pls. 19–21.)

Eschara? fragilissima, new species, p. 118, pl. 19, 3. Miocene: St. Mary's River, Maryland.
Lunulites oblonga Emmons, p. 121. Miocene(?): North Carolina.
Cellepora tumidula D'Orbigny, p. 127. Miocene: Petersburg, Virginia.
Cellepora formosa Tuomey and Holmes, p. 129. Miocene (?Pliocene): Darlington district, South Carolina.
Cellepora tessellata Tuomey and Holmes, p. 129. Miocene (?Pliocene): Giles Bluff, Peedee River, South Carolina.
Cellepora radiata Tuomey and Holmes, p. 129. Miocene (?Pliocene): Goose Creek, South Carolina.
Cellopora depressa Tuomey and Holmes, p. 129. Miocene (?Pliocene): Goose Creek, South Carolina.
Cellepora californiensis, new species, p. 130, pl. 19, fig. 12. Postpliocene: Santa Barbara, California.
Cellepora bellerophon, new species, p. 130, pl. 19, fig. 13. Postpliocene: Santa Barbara, California.
Reptocelleporaria informata D'Orbigny, p. 132. Miocene: Petersburg, Virginia; and South Carolina.
Reptocelleporaria quadrangularis D'Orbigny, p. 132. Locality not given.
Reptocelleporaria similis D'Orbigny, p. 133. Miocene (?Pliocene): Virginia and South Carolina.
Reptescharella hermannii, new species, p. 137, pl. 19, fig. 20. Postpliocene: Santa Barbara, California.
Reptescharella plana, new species, p. 137, pl. 19, fig. 19. Postpliocene: Santa Barbara, California.
Phidolopora labiata, new species, p. 138, pl. 19, fig. 21. Postpliocene: Santa Barbara, California.
Ennallipora quadrangularis, new species, p. 141, pl. 20, fig. 24. Miocene: Petersburg, Virginia.
Discoporella denticulata (Conrad), p. 142, pl. 20, fig. 25. Miocene: Generally distributed from New Jersey to South Carolina.
Reptoporina eustomata, new species, p. 144, pl. 20, fig. 26. Postpliocene: Santa Barbara, California.
Multiporina umbilicata (Lonsdale), p. 145, pl. 20, fig. 27. Miocene: Petersburg, Virginia.
Reptescharellina disparilis, new species, p. 147, pl. 20, fig. 29. Postpliocene: Santa Barbara, California.
Reptescharellina? hermannii, new species, p. 147, pl. 20, fig. 30. Postpliocene: Santa Barbara, California.
Reptescharellina cornuta, new species, p. 147, pl. 20, fig. 31. Postpliocene: Santa Barbara, California.
Siphonella multipora, new species, p. 154, pl. 20, fig. 38. Postpliocene: Santa Barbara, California.
Membranipora sexpunctata, new species, p. 159, pl. 20, fig. 44. Miocene or Eocene: Locality unknown.
Membranipora speciosa (Gabb and Horn), p. 159, pl. 20, fig. 45. Miocene(?): Chiriqui, Central America.

Membranipora californica, new species, p. 160, pl. 20, fig. 46. Postpliocene: Santa Barbara, California.

Membranipora barbarensis, new species, p. 160, pl. 20, fig. 47. Postpliocene: Santa Barbara, California.

Reptoflustrella tubulata, new species, p. 162, pl. 20, fig. 51. With *Membranipora sexpunctata*. Locality unknown, probably from the Virginia Miocene.

Pyriflustrella tuberculum D'Orbigny, p. 163. Locality not given.

Idmonea californica Conrad, p. 168, pl. 21, fig. 56. Postpliocene: Santa Barbara, California.

Semitubigera tuba, new species, p. 169, pl. 21, fig. 57. Postpliocene: Santa Barbara, California.

Entalophora punctulata, new species, p. 171, pl. 21, fig. 61. Postpliocene: Santa Barbara, California.

Crisina serrata, new species, p. 174, pl. 21, fig. 66. Postpliocene: Santa Barbara, California.

Lichenopora californica Conrad, p. 176, pl. 21, fig. 68. Postpliocene: Santa Barbara, California.

Multicrescis tortilis (Lonsdale), p. 178. Miocene: Virginia and South Carolina.

LISTS OF NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOAN FAUNAS.

[c.=common; v. c.=very common; r.=rare; v. r.=very rare.]

OLIGOCENE.

Oligocene (Antigua formation): Rifle butts, Antigua, Leeward Islands (loc. No. 6854)—
    Floridina fusifera Canu and Bassler, 1919. (v. r.)
    Floridina pyripora Canu and Bassler, 1919. (r.)
    Hippoporina lata Smitt, 1862. (r.)
    Porella bella Busk, 1860. (r.)
    Puellina radiata carolinensis Gabb and Horn, 1862. (r.)
Oligocene (Antigua formation): Carlisle marl pit, Antigua, Leeward Islands (loc. No. 6873)—
    Calpensia impressa Moll, 1803. (r.)
Oligocene (Anguilla formation): Southwest side of Crocus Bay and vicinity, Anguilla, Leeward Islands—
    Callopora dumerilli Savigny-Audouin 1826. (r.)
    Floridina pyripora Canu and Bassler, 1919. (r.)
    Holoporella albirostris Smitt, 1872. (r.)
    Ogivalina mutabilis Canu and Bassler, 1919. (r.)
    Puellina radiata carolinensis Gabb and Horn, 1862. (r.)
    Stephanosella biaperta Michelin, 1842. (r.)
    Stylopoma spongites Pallas, 1766. (r.)
Oligocene (Emperador limestone): one-third mile north of west of Empire, Panama Canal Zone (loc. No. 6016)—
    Holoporella albirostris Smitt, 1872. (r.)
    Ogivalina mutabilis Canu and Bassler, 1919. (r.)

LOWER MIOCENE FAUNAS.

Lower Miocene (Bowden horizon): Rio Cana, Santo Domingo—
    Cupuladria canariensis Busk, 1859. (r.)
    Mamillopora tuberosa Canu and Bassler, 1919. (c.)
    Metrarabdotos colligatum Canu and Bassler, 1919. (c.)
    Thalamoporella biperforata Canu and Bassler, 1919. (c.)
Lower Miocene (Bowden horizon): Rio Gurabo, Santo Domingo—
    Cupuladria canariensis Busk, 1859. (c.)
    Cupuladria umbellata Defrance, 1823. (c.)
    Labiopora miocenica Canu and Bassler, 1919. (r.)
    Mamillopora tuberosa Canu and Bassler, 1919. (c.)
    Thalamoporella biperforata Canu and Bassler, 1919. (c.)
    Thalamoporella granulata Levinsen, 1909. (r.)

- Lower Miocene (Bowden horizon): Santo Domingo—
  - *Cupuladria biporosa*, new species. (r.)
  - *Laminopora miocenica*, new species. (v. r.)
  - *Palmicellaria* cfr. *inermis* Jullien. (r.)
  - *Rhynchozoon curtum*, new species, (v. r.)
  - *Stylopoma magniporosa*, new species. (r.)
  - *Tremogasterina truncatorostris*, new species. (v. r.)
- Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo—
  - *Acanthodesia savarti* forma *monilifera* Canu and Bassler, 1919. (r.)
  - *Adeona porosa* Canu and Bassler, 1919. (r.)
  - *Aimulosia brevis*, new species. (r.)
  - *Corynostylus ellipticus* Canu and Bassler, 1919. (r.)
  - *Corynostylus labiatus* Canu and Bassler, 1919. (c.)
  - *Cupuladria canariensis* Busk, 1859. (r.)
  - *Cupularia umbellata* Defrance, 1823. (c.)
  - *Diaperoecia milneana* D'Orbigny, 1839. (r.)
  - *Hemiseptella lata* Canu and Bassler, 1919. (v. r.)
  - *Hippomenella infratelum* Canu and Bassler, 1919. (v. r.)
  - *Mamillopora tuberosa* Canu and Bassler, 1919. (c.)
  - *Membranipora vaughani* Canu and Bassler, 1919. (v. r.)
  - *Metrarabdotos colligatum* Canu and Bassler, 1919. (c.)
  - *Nellia oculata* Busk, 1852. (v. c.)
  - *Rhynchozoon vaughani* Canu and Bassler, 1919. (v. r.)
  - *Schizopodrella* (?) *mutabilis* Canu and Bassler, 1919. (r.)
  - *Smittina* (?) *brevis* Canu and Bassler, 1919. (r.)
  - *Steganoporella parvicella* Canu and Bassler, 1919. (c.)
  - *Thalamoporella biperforata* Canu and Bassler, 1919. (c.)
- Lower Miocene (Bowden marl): Bowden, Jamaica—
  - *Acanthodesia savarti* forma *texturata* Reuss, 1847. (v. c.)
  - *Adeona heckeli* Reuss, 1847. (r.)
  - *Aimulosia brevis*, new species. (c.)
  - *Bracebridgia deformis* Canu and Bassler, 1919. (r.)
  - *Callopora dumerillii* Savigny-Audouin, 1826. (r.)
  - *Conopeum lacroixii* Busk, 1872. (r.)
  - *Conopeum ovale*, new species. (v. r.)
  - *Cupuladria canariensis* Busk, 1859. (r.)
  - *Cupularia umbellata* Defrance, 1823. (c.)
  - *Cycloperiella rubra*, new species. (v. r.)
  - *Gemelliporella punctata* Canu and Bassler, 1919. (r.)
  - *Hemiseptella grandicella*, new species. (r.)
  - *Hippodiplosia baccata* Canu and Bassler, 1920. (r.)
  - *Holoporella albirostris* Smitt, 1872. (v. c.)
  - *Holoporella hemispherica*, new species. (r.)
  - *Mamillopora tuberosa* Canu and Bassler, 1919. (c.)
  - *Mastigophora granulosa*, new species. (v. r.)
  - *Membranipora osburni*, new species. (r.)
  - *Membranipora tenella* Hincks, 1880. (r.)
  - *Membrendoecium parvicapitatum*, new species. (r.)
  - *Metrarabdotos lacrymosum* Canu and Bassler, 1919. (c.)
  - *Rhamphostomella granulosa*, new species. (v. r.)
  - *Rhamphostomella laticella* Canu and Bassler, 1919. (v. r.)
  - *Rhynchozoon verruculatum* Smitt, 1872. (r.)
  - *Schizopodrella unicornis* Johnston, 1847. (r.)
  - *Smittina ophidiana* Waters, 1878. (v. r.)
  - *Steganoporella parvicella* Canu and Bassler, 1919. (c.)

- Lower Miocene (Bowden marl): Bowden, Jamaica—Continued.
  - *Stephanosella biaperta* Michelin, 1841. (r.)
  - *Stylopoma minuta*, new species. (r.)
  - *Terebripora elongata*, new species. (r.)
  - *Terebripora sinefilum*, new species. (r.)
  - *Thalamoporella biperforata* Canu and Bassler, 1919. (c.)
- Lower Miocene (Gatun formation): Banana River, Costa Rica—
  - *Cupuladria canariensis* Busk, 1859. (r.)
  - *Cupularia umbellata* Defrance, 1823. (c.)
  - *Mamillopora tuberosa* Canu and Bassler, 1919. (c.)
- Lower Miocene (Chipola marl): Chipola River, Calhoun County, Florida—
  - *Adeonellopsis coccinella*, new species. (r.)
  - *Callopora dumerilii* Savigny-Audouin, 1826. (r.)
  - *Cupularia umbellata* Defrance, 1823. (c.)
  - *Gemelliporella vorax*, new species. (r.)
  - *Leiosella edax*, new species. (r.)

MIOCENE OF MARYLAND.

- Miocene (Choptank formation): Cordova, Maryland—
  - *Acanthodesia savarti* forma *bifoliata* Ulrich and Bassler, 1904. (c.)
  - *Microporella bifoliata* Ulrich and Bassler, 1904. (r.)
- Miocene (Choptank formation): Governor Run, Maryland—
  - *Acanthodesia oblongula* Ulrich and Bassler, 1904. (r.)
  - *Schizopodrella unicornis* Johnston, 1847. (r.)
- Miocene (Choptank formation): Greensboro, Maryland—
  - *Holoporella massalis* Ulrich and Bassler, 1904.
- Miocene (Choptank formation): Pawpaw Point, Maryland—
  - *Conopeum? nitidulum* Ulrich and Bassler, 1904. (r.)
- Miocene (Choptank formation): Dover Bridge, Maryland—
  - *Acanthodesia oblongula* Ulrich and Bassler, 1904. (r.)
  - *Conopeum germanum* Ulrich and Bassler, 1904. (v. r.)
  - *Retepora doverensis* Ulrich and Bassler, 1904. (c.)
  - *Schizopodrella doverensis* Ulrich and Bassler, 1904. (r.)
- Miocene (Choptank formation): Jones Wharf, Maryland—
  - *Acanthodesia oblongula* Ulrich and Bassler, 1904. (r.)
  - *Acanthodesia savarti* forma *bifoliata* Ulrich and Bassler, 1904. (c.)
  - *Chaperia caminosa* Ulrich and Bassler. (r.)
  - *Crisina striatopora* Ulrich and Bassler, 1904. (r.)
  - *Microporella ciliata* Linnaeus, 1759. (r.)
  - *Retepora doverensis* Ulrich and Bassler, 1904. (c.)
  - *Schizoporella cumulata* Ulrich and Bassler. (r.)
  - *Schizoporella latisinuata* Ulrich and Bassler, 1904. (r.)
- Miocene (Calvert formation): Reed's, Maryland—
  - *Acanthodesia oblongula* Ulrich and Bassler, 1904. (c.)
  - *Cellepora cribrosa* Ulrich and Bassler, 1904. (v. r.)
  - *Conopeum lacroixii* Busk, 1852. (r.)
  - *Cyclicopora mansfieldi*, new species. (v. r.)
  - *Membranipora fossulifera* Ulrich and Bassler, 1904. (v. r.)
  - *Ogivalina parvula* Ulrich and Bassler, 1904. (r.)
  - *Porella convoluta* Ulrich and Bassler, 1904. (r.)
  - *Porella punctata* Ulrich and Bassler, 1904. (v. r.)
- Miocene (Calvert formation): Plum Point, Maryland—
  - *Acanthodesia oblongula* Ulrich and Bassler, 1904. (c.)
  - *Cellepora maculata* Ulrich and Bassler, 1904. (c.)
  - *Holoporella massalis* Ulrich and Bassler, 1904. (r.)

- Miocene (Calvert formation): 1 mile south of Parkers Creek, Calvert County, Maryland—
  - *Callopora parvirostris*, new species. (v. r.)
  - *Cribrilina ligulata*, new species. (v. r.)
- Miocene (Calvert formation): Chesapeake Beach, Maryland—
  - *Acanthodesia oblongula* Ulrich and Bassler, 1904. (c.)
  - *Holoporella massalis* Ulrich and Bassler, 1904. (r.)
- Miocene (St. Mary's formation): St. Mary's River, Maryland—
  - *Cupularia denticulata* Conrad, 1841. (r.)
  - *Hemiseptella fistula* Ulrich and Bassler, 1904. (v. r.)
  - *Holoporella massalis* Ulrich and Bassler, 1904. (r.)
  - *Lepralia montifera* Ulrich and Bassler, 1904. (v. r.)
  - *Theonoa glomerata* Ulrich and Bassler, 1904. (r.)
- Miocene (St. Mary's formation): Cove Point, Maryland—
  - *Amphiblestrum constrictum* Ulrich and Bassler, 1904. (r.)
  - *Conopeum germanum* Ulrich and Bassler, 1904. (v. r.)
  - *Cribrilina punctata* Hassall, 1841. (r.)
  - *Idmonea expansa* Ulrich and Bassler, 1904. (r.)
  - *Membranipora tuberimargo*, new species. (v. r.)
  - *Microporella ciliata* Linnaeus, 1759. (r.)
  - *Porella reversa* Ulrich and Bassler, 1904. (r.)
  - *Ramphonotus agellus* Ulrich and Bassler, 1904. (r.)
  - *Schizoporella cumulata* Ulrich and Bassler, 1904. (r.)

MIOCENE OF VIRGINIA.

- Miocene (St. Mary's formation): Bowlers wharf, 18 miles above Urbana, Middlesex County, Virginia—
  - *Acanthodesia savartii* forma *typica*. (r.)
  - *Conopeum lacroixii* Busk, 1852. (r.)
  - *Membraniporina baccata*, new species. (r.)
  - *Ramphonotus agellus* Ulrich and Bassler, 1904. (r.)
  - *Schizopodrella unicornis* Johnston, 1847. (r.)
  - *Spathipora longicauda*, new species. (v. r.)
- Miocene (Yorktown formation): Yorktown, Virginia—
  - *Cellepora maculata* Ulrich and Bassler, 1904. (r.)
  - *Dakaria grandis*, new species. (r.)
  - *Floridina regularis*, new species. (r.)
  - *Gemelliporella vorax*, new species. (r.)
  - *Hippaliosina rostrigera* Smitt, 1872. (c.)
  - *Hippoporella spinosa*, new species. (r.)
  - *Holoporella* (?) *echinata*, new species. (v. r.)
  - *Membranipora flabellata* Canu, 1906. (r.)
  - *Microporella fissurifera*, new species. (v. r.)
  - *Ramphonotus asperus*, new species. (r.)
  - *Stylopoma spongites* Pallas, 1766. (c.)
  - *Terebripora parvicella*, new species. (r.)
  - *Tretocycloecia tortilis* Lonsdale, 1845. (c.)
- Miocene (Yorktown formation): 1 mile northeast and 1 mile west of Suffolk, Virginia—
  - *Acanthodesia savarti* forma *typica*. (r.)
  - *Atelesopora reptans*, new species. (r.)
  - *Ceriopora virginiana*, new species. (v. r.)
  - *Cycloperiella rubra*, new species.
  - *Gemelliporella vorax*, new species. (r.)
  - *Hippaliosina rostrigera* Smitt, 1872. (c.)
  - *Membranipora flabellata* Canu, 1906. (r.)
  - *Microporella fissurifera*, new species. (r.)
  - *Ramphonotus asperus*, new species. (r.)

Upper Miocene (Yorktown formation): 3 miles southwest of Petersburg, Virginia—
Acanthodesia rectangularia, new species. (v. r.)
Adeona heckeli Reuss. (c)
Amphiblestrum constrictum Ulrich and Bassler, 1904. (r.)
Atelesopora reptans, new species. (r.)
Berenicea flabellum? Reuss, 1847. (r.)
Callopora lanceolata, new species. (v. r.)
Cycloperiella rubra, new species. (c.)
Dakaria torquata D'Orbigny, 1839. (v. r.)
Gemelliporella vorax, new species. (r.)
Hippaliosina rostrigera Smitt, 1872. (c.)
Hippodiplosia bigibbera, new species. (r.)
Membraniporina vincularina, new species. (v. r.
Microporella fissurifera, new species. (r.)
Ramphonotus asperus, new species. (r)
Stylopoma spongites Pallas, 1766. (c.)
Tretocycloecia tortilis Lonsdale, 1845. (c.)

Miocene (Yorktown formation): 1 mile west of Fort Nonsense, Gloucester County, Virginia—
Atelesopora reptans, new species. (r.)
Cyclocopora spinifera, new species. (r.)
Gemelliporella vorax, new species. (r.)
Microporella fissurifera, new species. (r.)
Ramphonotus asperus, new species. (r.)
Schizopodrella unicornis Johnston, 1842. (r.)
Trypostega venusta Norman, 1864. (r.)

Miocene (Yorktown formation): 1 mile south of Cash, Gloucester County, Virginia—
Atelesopora reptans, new species. (r.)
Cyclocolposa spinifera, new species. (r.)
Ramphonotus asperus, new species. (r.)

Miocene (Yorktown formation): 2 miles southwest of Cash, Gloucester County, Virginia—
Cyclocolposa spinifera, new species. (r.)
Cycloperiella rubra, new species. (c.)
Dakaria torquata D'Orbigny, 1839. (r.)
Ramphonotus asperus, new species. (r.)
Stylopoma spongites Pallas, 7766. (c.)
Tretocycloecia avellana, new species. (r)

Miocene (Yorktown formation): Near Powcan, King and Queen County, Virginia (loc. No. 8205)—
Adeona heckeli Reuss, 1847. (r.)
Berenicea flabellum? Reuss. (r.)
Cycloperiella rubra, new species. (r.)
Cyclocolposa spinifera, new species. (r.)
Gemelliporella vorax, new species. (r.)

Miocene (Yorktown formation): Beulahland, King and Queen County, Virginia (loc. No. 8229)—
Atelesopora reptans, new species. (r.)
Berenicea flabellum? Reuss, 1847. (r.)
Callopora lanceolata, new species. (r.)
Cyclocolposa spinifera, new species. (r.)
Cycloperiella rubra, new species. (r.)
Ramphonotus asperus, new species. (r.)
Schizopodrella unicornis Johnston, 1847. (r.

Miocene (Yorktown formation): One-third mile north of Macedonia Church, Essex County, Virginia (loc. No. 8208)—
Atelesopora reptans, new species. (r.
Microporella fissurifera, new species. (v. r.
Ramphonotus asperus, new species. r.

Miocene (Yorktown): York River, Virginia—
Cupularia denticulata Conrad, 1841. (r.)
Hemiseptella filimargo, new species. (v. r.)
Holoporella rostrifera, new species. (v. r.)
Miocene (Yorktown formation): Williamsburg, Virginia—
Cupularia denticulata Conrad, 1841. (r.)
Tretocycloecia tortilis, Lonsdale, 1845. (c.)
Miocene (Yorktown formation): 1½ miles southwest of Reed's Ferry, Virginia—
Cyclicopora? mansfieldi, new species. (v. r.)

MIOCENE OF NORTH CAROLINA.

Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina—
Adeona heckeli Reuss, 1847. (r.)
Aimulosia aculeata, new species. (c.)
Alderina cesticella, new species. (r.)
Atelesopora reptans, new species. (r.)
Cellepora maculata Ulrich and Bassler, 1904. (r.)
Cupularia denticulata Conrad, 1841. (r.)
Cupularia umbellata De France.
Cycloperiella rubra, new species. (c.)
Floridina minuta, new species. (r.)
Floridina regularis, new species. (c.)
Gemelliporella vorax, new species. (c.)
Hippaliosina rostrigera Smitt, 1872. (c.)
Puellina radiata-scripta Reuss.
Schizopodrella unicornis Johnson, 1847.
Stylopoma spongites Pallas, 1766. (c.)
Terebripora parvicella, new species. (r.)
Velumella elongata, new species. (r.)
Vibracellina pusilla, new species. (r.)
Vibracellina simplex, new species. (r.)
Miocene: Kuhns, Carteret County, North Carolina—
Lagenipora brevicollis, new species. (r.)
Membranipora fossulifera Ulrich and Bassler, 1904. (r.)
Membranipora spiculata, new species. (r.)
Microporella ciliata Linnaeus, 1759. (r.)
Porella reversa Ulrich and Bassler ,1904. (r.)
Pyripora brevicauda, new species.
Miocene (Duplin marl): Lake Waccamaw, North Carolina—
Schizopodrella floridina Osburn, 1914. (r.)
Miocene (Duplin marl): Snow Hill, Green County, North Carolina—
Membranipora flabellata Canu, 1906. (r.)
Miocene (Duplin marl): 2½ miles northwest of Chocowinity, North Carolina—
Membranipora flabellata Canu, 1906. (r.)
Miocene (Duplin): 10 miles south of Greenville, North Carolina—
Cycloperiella rubra, new species. (c.)
Microporella fissurifera, new species. (r.)
Tretocycloecia avellana, new species. (r.)
Miocene (Duplin marl): 28 miles northwest of Wilmington, North Carolina—
Holoporella parvula, new species. (r.)
Holoporella subturrita, new species. (v. r.)
Miocene (Duplin marl): Wilmington, North Carolina—
Adeona heckeli Reuss, 1847. (c.)
Aimulosia aculeata, new species. (r.)
Callopora dumerilii Savigny-Audouin, 1826. (r.)

Miocene (Duplin marl): Wilmington, North Carolina—Continued.
- *Cellepora minuta*, new species. (r.)
- *Cupularia denticulata* Conrad, 1841. (v. c.)
- *Cupularia doma* D'Orbigny, 1851.
- *Cupularia umbellata* Defrance, 1823. (c.)
- *Cycloperiella rubra*, new species. (c.)
- *Floridina regularis*, new species. (c.)
- *Gemelliporella vorax*, new species. (c.)
- *Hemiseptella rectangulata*, new species. (r.)
- *Hippoporina gibbosa*, new species. (r.)
- *Holoporella orbifera*, new species. (r.)
- *Holoporella subturrita*, new species. (r.)
- *Lacerna mucronata* Smitt, 1872. (v. r.)
- *Membrendoecium grande*, new species. (v. r.)
- *Proboscina mesleri*, new species. (r.)
- *Puellina radiata* forma *scripta* Reuss, 1847. (r.)
- *Schizopodrella floridina* Osburn, 1915. (v. r.)
- *Schizopodrella unicornis* Johnston, 1847. (c.)
- *Smittina trispinosa* Johnston, 1838. (c.)
- *Stephanosella biaperta* Michelin, 1841. (r.)
- *Stylopoma spongites* Pallas, 1766. (c.)
- *Trypostega venusta* Norman, 1864. (v. r.)

MIOCENE OF SOUTH CAROLINA, FLORIDA, AND CUBA.

Miocene (Duplin marl): Muldrows Mills, 5 miles south of Mayville, Sumter County, South Carolina—
- *Aimulosia aculeata*, new species. (r.)
- *Atelesopora reptans*, new species. (r.)
- *Cellepora maculata* Ulrich and Bassler, 1904. (r.)
- *Gemelliporella vorax*, new species. (r.)
- *Schizopodrella unicornis* Johnston, 1847. (v. r.)
- *Stylopoma spongites* Pallas, 1766. (r.)

Miocene (Duplin marl): Darlington, South Carolina—
- *Microporella hexagona*, new species. (r.)
- *Stylopoma spongites* Pallas, 1766. (r.)

Miocene: Giles Bluff, Peedee River, South Carolina—
- *Microporella tessellata* Tuomey and Holmes.

Miocene: Smith's, Goose Creek, South Carolina—
- *Hemiseptella lacinia* Tuomey and Holmes.
- *Tretocycloecia tortilis* Lonsdale, 1845.

Miocene: Charleston, South Carolina—
- *Hemiseptella granulosa*, new species. (v. r.)

Miocene Harvey's Mills, Leon County, Florida—
- *Aimulosia aculeata*, new species. (r.)
- *Cellepora maculata* Ulrich and Bassler, 1904. (v. r.)
- *Cyclocolposa tenuiparietis*, new species. (r.)
- *Holoporella orbifera*, new species. (r.)

Miocene: Santiago, Cuba—
- *Cribrilina cuspidata*, new species. (v. r.)

Miocene (Choctawhatchee marl): Jackson's Bluff, Ocklockonee River, Leon County, 25 miles southwest of Tallahassee, Florida—
- *Acanthodesia savarti* forma *delicatula* Busk, 1859. (r.)
- *Amphiblestrum tenuiparietis*, new species. (r.)
- *Arthropoma cornuta*, new species. (r.)
- *Cellepora maculata* Ulrich and Bassler, 1904. (v. r.)
- *Chaperia parvispina*, new species. (v. r.)
- *Cupuladria canariensis* Busk, 1859. (r.)

Miocene (Choctawhatchee marl): Jackson's Bluff, Ocklockonee River, Leon County, 25 miles southwest of Tallahassee, Florida—Continued.
- *Cupularia denticulata* Conrad, 1841. (c.)
- *Gemelliporella asper*, new species. (r.)
- *Gemelliporella vorax*, new species. (r.)
- *Hippoporella? papulifera*, new species. (v. r.)
- *Hippoporina (?) vestita*, new species. (r.)
- *Idmonea planula*, new species. (v. r.)
- *Membraniporidra parca*, new species. (v. r.)
- *Membraniporina vincularina*, new species. (r.)
- *Membrendoecium parvicapitatum*, new species. (r.)
- *Microporella ciliata* Linnaeus, 1759. (r.)
- *Puellina innominata* Couch, 1844. (v. r.)
- *Schizopodrella floridina* Osburn, 1914. (v. r.)
- *Schizopodrella pusilla*, new species. (r.)
- *Steganoporella magnilabris* Busk, 1854. (v. r)
- *Tremogasterina horrida*, new species. (r.)
- *Vibracellina simplex*, new species. (v. r.)

PLIOCENE OF SOUTH CAROLINA AND FLORIDA.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina—
- *Aimulosia aculeata*, new species. (r.)
- *Amphiblestrum constrictum* Ulrich and Bassler, 1904. (r.)
- *Cellepora minuta*, new species. (r.)
- *Cupularia denticulata* Conrad, 1841. (v. c.)
- *Cyclocolposa perforata*, new species. (v. c.)
- *Cycloperiella rubra*, new species. (c.)
- *Dakaria parviporosa*, new species. (v. r.)
- *Electra monostachys* Busk, 1875. (r.)
- *Floridina parvicella*, new species. (v. r.)
- *Gemelliporella asper*, new species. (v.)
- *Gemelliporella vorax*, new species. (c.)
- *Hemiseptella planulata*, new species. (r.)
- *Holoporella bicornis*, new species. (r.)
- *Holoporella orbifera*, new species. (c.)
- *Membranipora lacroixii* Audouin, 1826. (r.)
- *Membrendoecium grande*, new species. (r.)
- *Metrarabdotos auriculatum*, new species. (c.)
- *Microporella tessellata* Tuomey and Holmes, 1857. (r.)
- *Puellina crassilabiata*, new species. (r.)
- *Schizopodrella aculeata*, new species. (v. r.)
- *Schizopodrella marginata*, new species. (r.)
- *Smittina trispinosa* Johnston, 1838. (r.)
- *Spathipora longirima*, new species. (r.)
- *Tretocycloecia avellana*, new species. (v. r.)

Pliocene (Caloosahatchie marl): Shell Creek, De Soto County, Florida—
- *Adeona heckeli* Reuss, 1847. (c.)
- *Aimulosia brevis*, new species. (r.)
- *Aimulosia radiata*, new species. (v. r.)
- *Gemelliporella vorax*, new species. (r.)
- *Metrarabdotos auriculatum*, new species. (v. c.)
- *Rhynchozoon verruculatum* Smitt, 1872. (r.)
- *Schismopora brevincisa*, new species. (c.)
- *Schizoporella doverensis* Ulrich and Bassler, 1904. (v. r.)
- *Smittina maleposita*, new species. (v. r.)

- Pliocene (Caloosahatchie marl); Shell Creek, De Soto County, Florida—Continued.
  - *Smittina trispinosa* Johnston, 1838. (c.)
  - *Stylopoma spongites* Pallas, 1766. (c.)
  - *Vibracellina pusilla*, new species. (v. r.)
  - *Holoporella albirostris* Smitt. (v. c.)
- Pliocene (Caloosahatchie marl): Monroe County, Florida—
  - *Cupuladria canariensis* Busk, 1859. (r.)
  - *Cupularia denticulata* Conrad, 1841. (v. c.)
  - *Gemelliporella vorax*, new species. (c.)
  - *Hippaliosina rostrigera* Smitt, 1872. (r.)
  - *Holoporella albirostris* Smitt, 1872. (v. c.)
  - *Metrarabdotos auriculatum*, new species. (v. c.)
  - *Schizopodrella unicornis* Johnston, 1847. (r.)
  - *Smittina trispinosa* Johnston, 1838. (c.)
  - *Steganoporella magnilabris* Busk, 1854. (v. r.)
  - *Stylopoma spongites* Pallas, 1766. (c.)

PLEISTOCENE OF THE ATLANTIC COAST.

- Pleistocene: Simmons Bluff, Yonges Island, Charleston County, South Carolina—
  - *Hemiseptella tuberosa*, new species. (r.)
  - *Rhynchozoon verruculatum* Smitt, 1872. (v. r.)
  - *Schizopodrella unicornis* Johnston, 1847. (r.)
  - *Smittina trispinosa* Johnston, 1838. (c.)
  - *Stylopoma spongites* Pallas, 1766. (r.)
- Pleistocene or Recent: Vero, Florida—
  - *Acanthodesia savarti* forma *texturata* Reuss, 1847. (r.)
  - *Acanthodesia savarti* forma *typica*. (c.)
  - *Smittina maleposita*, new species. (r.)
  - *Smittina trispinosa* Johnston, 1838. (r.)
  - *Stephanosella biaperta* Michelin, 1842. (r.)
  - *Stylopoma spongites* Pallas, 1766. (r.)
- Pleistocene: Daytona, Florida—
  - *Schizopodrella unicornis* Johnston, 1847. (r.)
  - *Smittina trispinosa* Johnston, 1838. (r.)
- Pleistocene: Los Angeles, California—
  - *Cellaria diffusa* Robertson, 1905. (r.)
  - *Cellaria mandibulata* Hincks, 1882. (v. c.)
  - *Hippothoa hyalina* Linnaeus, 1768. (r.)
  - *Stephanosella biaperta* Michelin, 1842. (r.)
- Pleistocene: Mount Hope, Panama Canal Zone—
  - *Callopora filum* Jullien, 1903. (r.)
  - *Callopora guernei* Jullien, 1903. (v. r.)
  - *Cyclicopora multilamellosa*, new species. (r.)
  - *Dakaria chevreuxi* Jullien, 1903. (r.)
  - *Hippoporella costulata*, new species. (v. r.)
  - *Hippoporina pusilla*, new species. (v. r.)
  - *Holoporella aviculifera*, new species. (r.)
  - *Holoporella mucronata*, new species. (v. r.)
  - *Holoporella turrita* Smitt, 1873. (v. r.)
  - *Mastigophora pesanseris* Smitt, 1872. (r.)
  - *Membranipora osburni*, new species. (r.)
  - *Porella* (*Palmicellaria*) *costulata*, new species. (r.)
  - *Rhynchozoon* (?) *levigatum*, new species. (v. r.)
  - *Schizoporella magniporosa*, new species. (v. r.)
  - *Stylopoma projecta*, new species. (r.)
  - *Stylopoma spongites* Pallas, 1766. (r.)

PLEISTOCENE OF THE PACIFIC COAST.

Pleistocene: Santa Barbara, California—
- *Callopora crassospina*, new species. (r.)
- *Callopora horrida* Hincks, 1880. (r.)
- *Callopora* (?) *multipora* Gabb and Horn, 1862.
- *Cauloramphus porosus*, new species. (r.)
- *Cauloramphus triangularis*, new species. (r.)
- *Chaperia galeata* Busk, 1852. (v. r.)
- *Conopeum barbarensis* Gabb and Horn, 1862. (r.)
- *Crisia serrata* Gabb and Horn, 1862. (v. c.)
- *Cystisella aviculifera*, new species. (r.)
- *Electra monostachys* Busk, 1875. (r.)
- *Fenestrulina malusi* Savigny-Audouin, 1826. (c.)
- *Filisparsa clarki*, new species. (r.)
- *Filisparsa clarki*, var. *parvula*, new variety. (r.)
- *Hincksina multispinata*, new species. (v. r.)
- *Hippothoa hyalina* Linnaeus, 1768. (r.)
- *Hippothoa hyalina*, var. *rugosa*, new variety. (v. r.)
- *Holoporella umbonata*, new species. (r.)
- *Idmonea californica* D'Orbigny, 1852. (v. c.)
- *Lichenopora californica* Conrad, 1855. (r.)
- *Lichenopora hispida* Fleming, 1828. (r.)
- *Membraniporina californica* Gabb and Horn.
- *Metracolposa mucronata*, new species. (r.)
- *Micropora coriacea* Esper, 1794. (r.)
- *Microporella californica* Hincks, 1882. (c.)
- *Microporella ciliata* Linnaeus, 1759. (r.)
- *Microporella customata* Gabb and Horn, 1862.
- *Microporella heermani* Gabb and Horn, 1862.
- *Microporella umbonata* Hincks, 1882. (v. r.)
- *Microporella vibraculifera* Hincks, 1882. (v. r.)
- *Phidolopora labiata* Gabb and Horn, 1862. (v. c.)
- *Porella collifera* Robertson, 1908. (c.)
- *Psilosolen capitiferax*, new species. (v. c.)
- *Puellina heermanni* Gabb and Horn, 1862. (v. r.)
- *Puellina radiata* forma *scripta* Reuss, 1847. (r.)
- *Ramphonotus multispinatus*, new species. (r.)
- *Schismopora abrupta*, new species. (r.)
- *Schizolavella vulgaris* Moll, 1803. (v. r.)
- *Schizomavella longirostrata* Hincks, 1883. (r.)
- *Smittina californiensis* Robertson, 1908. (r.)
- *Stathmepora flabellata*, new species. (c.)
- *Tubucellaria punctata* Gabb and Horn, 1862. (v. c.)
- *Tubucellaria punctata*, var. *minor*, new variety. (r.)
- *Tubulipora fasciculifera* Hincks, 1884. (r.)
- *Tubulipora tuba* Gabb and Horn, 1862. (r.)

Pleistocene: Santa Monica, California.
- *Callopora circumclathrata* Hincks, 1881. (r.)
- *Cellaria diffusa* Robertson, 1905. (r.)
- *Cellaria fissurifera*, new species. (r.)
- *Costazzia robertsoniae*, new species. (r.)
- *Crisia serrata* Gabb and Horn, 1862. (v. c.)
- *Cupularia robertsoniae*, new species. (r.)
- *Cyclicopora* (?) *gigantea*, new species. (r.)
- *Cystisella aviculifera*, new species. (r.)
- *Diaperoecia flabellata*, new species. (r.)

Pleistocene: Santa Monica, California—Continued.

- *Entalophora fasciculifera*, new species. (r.)
- *Fenestrulina porosa*, new species. (r.)
- *Hincksina quadrispinosa*, new species. (r.)
- *Hippothoa hyalina* Linnaeus, 1768. (r.)
- *Holoporella umbonata*, new species. (v. r.)
- *Idmonea californica* D'Orbigny, 1852. (r.)
- *Idmonea dispar*, new species. (c.)
- *Lepralia cribrosa* (?) Maplestone, 1900. (v. r.)
- *Lichenopora radiata* Savigny-Audouin, 1826. (r.)
- *Lichenopora verrucaria* Fabricius, 1780. (v. r.)
- *Membranipora tuberculata* Bosc, 1802. (r.)
- *Microporella californica* Hincks, 1882. (r.)
- *Microporella ciliata* Linnaeus, 1759. (r.)
- *Microporella eustomata* Gabb and Horn, 1862. (r.)
- *Microporella gibbera*, new species. (v. r.)
- *Microporella heermanni* Gabb and Horn, 1862. (r.)
- *Microporella umbonata* Hincks, 1882. (r.)
- *Microporella vibraculifera* Hincks, 1883. (r.)
- *Mystriopora* (?) *areblata*, new species. (v. r.)
- *Phidolopora labiata* Gabb and Horn, 1862. (c.)
- *Phidolopora pacifica* Robertson, 1908. (r.)
- *Phylactella spinosissima*, var. *major* Hincks, 1884. (r.)
- *Porella collifera* Robertson, 1908. (r.)
- *Porella cyclopea*, new species. (r.)
- *Puellina radiata* forma *rarecosta* Reuss, 1847. (r.)
- *Rhynchozoon grandicella*, new species. (r.)
- *Schismopora lanceolata*, new species. (r.)
- *Smittina discoidea*, new species. (c.)
- *Smittina grandicella*, new species. (r.)
- *Smittina porifera* Hincks, 1884. (r.)
- *Stathmepora flabellata*, new species. (r.)
- *Stephanosella biaperta* Michelin, 1841. (r.)
- *Trypematella papulifera*, new species. (r.)
- *Tubucellaria punctata* Gabb and Horn, 1862. (r.)
- *Tubucellaria punctata*, var. *minor*, new variety. (r.)
- *Tubulipora tuba* Gabb and Horn, 1862. (r.)

Pleistocene: Dead Mans Island, off San Pedro, California.—

- *Diaperoecia flabellata*, new species. (v. r.)
- *Entalophora fasciculifera*, new species. (v. r.)
- *Eurystomella bilabiata* Hincks, 1884. (r.)
- *Fenestrulina malusi* Savigny-Audouin, 1826. (v. r.)
- *Hippothoa hyalina* Linnaeus, 1768. (r.)
- *Idmonea californica* D'Orbigny, 1852. (v. c.)
- *Idmonea clarki*, new species. (r.)
- *Lagenipora spinulosa* Hincks, 1881. (r.)
- *Microporella californica* Hincks, 1884. (r.)
- *Microporella ciliata* Linnaeus, 1759. (r.)
- *Microporella umbonata* Hincks, 1882. (v. r.)
- *Microporella vibraculifera* Hincks, 1883. (r.)
- *Phidolopora labiata* Gabb and Horn, 1862. (r.)
- *Phidolopora pacifica* Robertson, 1908. (r.)
- *Psilosolen capitiferax*, new species. (r.)
- *Stephanosella biaperta* Michelin, 1841. (v. r.)
- *Terebripora pacifica*, new species (r.) (San Pedro.)
- *Tubucellaria punctata* Gabb and Horn, 1862. (r.)
- *Tubulipora tuba* Gabb and Horn, 1862. (r.)

SYSTEMATIC DESCRIPTIONS.

Class BRYOZOA Ehrenberg.

Order CTENOSTOMATA Busk.

Family TEREBRIPORIDAE Busk, 1839.

Genus TEREBRIPORA D'Orbigny, 1839.

For description see Bulletin 106, United States National Museum, p. 842.)

TEREBRIPORA PARVICELLA, new species.

Plate 27, figs. 15, 16.

Description.—The canalicules are very thin and branch almost at a right angle. The zooecia are very *small*, arranged somewhat obliquely on the canalicules.

Occurrence.—Miocene (Yorktown formation): Yorktown, Virginia (rare). Miocene (Duplin marl): Natural Wells, 2 miles southwest of Magnolia, North Carolina (rare).

Holotype.—Cat. No. 68389, U.S.N.M.

TEREBRIPORA SINEFILUM, new species.

Plate 3, figs. 14, 15.

Description.—The canalicules are very thin; they branch obliquely and disappear on the adult zooecia. The young zooecia are small and united among themselves; the old zooecia are large and not united.

Structure.—Our specimens show no zooecia intact and the perforations alone are visible. The cavity containing the cellule alone persists. It is quite remarkable that the canalicules disappear when the cavities are deep. These two sorts of perforations are moreover visible on the same zoarium.

Occurence.—Miocene (Bowden marl); Bowden Jamaica (rare).

Cotypes.—Cat. No. 68390, U.S.N.M.

TEREBRIPORA ELONGATA, new species.

Plate 3, figs. 16, 17.

We know this species only from the perforations left in shells and are therefore not able to give a complete description. The canalicules branch almost at a right angle. The distance between the zooecia is equal to their length. The zooecia are much larger than those of *Terebripora falunica* Fischer, 1866, which is found in Europe at the corresponding geological horizon.

Occurence.—Miocene (Bowden marl): Bowden, Jamaica (rare).

Holotype.—Cat. No. 68391, U.S.N.M.

TEREBRIPORA PACIFICA, new species.

Plate 46, fig. 13.

This species is known only from the perforations left by it, but these are so distinct that it can easily be recognized. The zooecia appear small, pyriform approaching each other from one to two times their length. The ternary axes are deprived of zooecia but they bear unicellular ramifications. In this character this new species is close to *Terebripora irregularis* D'Orbigny, 1839, but it differs from it in that the distance between the zooecia is much less than five or six times their length.

Occurrence.—Pleistocene: San Pedro, California (rare).

Holotype.—Cat. No. 68392. U.S.N.M.

Genus SPATHIPORA Fischer, 1866.

SPATHIPORA LONGICAUDA, new species.

Plate 27, figs. 12,13.

Description.—The principal axes are linear and do not bear zooecia: they intersect each other at about an angle of 90°. The zooecia are attached to them and are arranged alternately; they are thin, elongated, fusiform and are provided with a long peduncle; the angle of insertion is about 45°.

Affinities.—This species differs from *Spathipora sertum* Fischer, 1863, wide spread in the Helvetian faluns of France, in the great length of the peduncle of insertion.

Occurrence.—Miocene (St. Marys formation): 18 miles above Urbana, Middlesex County, Virginia (very rare).

Holotype.—Cat. No. 68393, U.S.N.M.

SPATHIPORA LONGIRIMA, new species.

Plate 47, fig. 3.

Description.—The canalicules are delicate, rectilinear, branching at an angle varying from 45° to 90°. The zooecia are conical, attached directly to the canalicules, without a peduncle. The apertura is terminal, orbicular, with a very *long rimule* prolonged over almost all the frontal.

Affinities.—This species differs from *Spathipora cucullata* in which the form is identical, in its very long rimule. It differs from *Spathipora longicauda* in the absence of a peduncle to the zooecia.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw, River, Horry County South Carolina (rare).

Holotype.—Cat. No. 68394, U.S.N.M.

SPATHIPORA CUCULLATA, new species.

Plate 27, fig. 14.

Description.—The canalicules are delicate, deeply buried in the surface of shells; the ramifications are little oblique. The zooecia are conical, in the form of a cornet of paper; their apertura is at the level of the shell, and their peduncles, attached to a canalicule, are deeply buried and very short.

Affinities.—Of the preceding species, *Spathipora longicauda*, we know only the perforations left by the zooecia. In the present one, on the contrary, the zooecium is entire because it is entirely embedded in the shell substance. We have no knowledge of the mechanism employed by this species in perforating the shell.

Occurence. Miocene (Yorktown formation): Beulahland, King and Queen County, Virginia (rare).

Holotype.—Cat. No. 68395, U.S.N.M.

Order CHEILOSTOMATA Busk.

Suborder ANASCA Levinsen.

Division I. MALACOSTEGA Levinsen

Family ELECTRINIDAE D'Orbigny, 1851.

Genus ELECTRA Lamouroux, 1816.

(For description, see Bulletin 106, U. S. National Museum, p. 76.)

ELECTRA MONOSTACHYS Busk, 1854.

Plate 29, figs. 1–3.

1854. *Membranipora monostachys* Busk, Catalogue marine Polyzoa in British Museum, pt. 2, Cheilostomata, p. 61, pl. 70, figs. 1–4.
1859. *Membranipora monostachys* Busk, Monograph fossil Polyzoa of the Crag, Publications Paleontographical Society, London, vol. 14, p. 31, pl. 2, fig. 2.
1880. *Membranipora monostachys* Hincks, British Marine Polyzoa, p. 131, pl. 17, figs. 3, 4; pl. 18, figs. 1–4.
1889. *Membranipora monostachys* Jelly, A Synonymic Catalogue of Marine Bryozoa, p. 155 (Cites bibliography).
1896. *Membranipora monostachys* Calvet, Bryozoaires: Résultats scientifiques de la Campagne du "*Cauden*" dans le Golfe de Gascogne, Annales de l'Université de Lyon, vol. 26, p. 253.
1900. *Membranipora monostachys* Waters, Bryozoa from Franz-Josef Land, Journal Linnean Society London, vol. 28, p. 59, pl. 8, fig. 3.
1904. *Membranipora monostachys* Calvet, Bryozoen: Ergebnisse der Hamberger Magalhaensiche Sammelreise, p. 13.
1911. *Membranipora monostachys* Guérin-Ganivet, Bryozoaires de l'expedition des Jacques Cartier, Bulletin de l'Institut oceanigraphique, no. 207, p. 9.
1912. *Electra monostachys* Nordgaard, Revision av Universitetsmuseets samling ar norske Bryozoer, Kgl. norske Videnskabers Selskabs Skriften, 1911, no. 3, pp. 1–19.
1912. *Membranipora monostachys* Osburn, The Bryozoa of the Woods Hole Region, Bulletin Bureau Fisheries, vol. 30, 1910, p. 227, pl. 22, fig. 29; pl. 39, fig. 87.
1914. *Electra monostachys* Canu, Contribution a l'etude des Bryozoaires fossiles, Les Bryozoaires du Stampien, XIV, Bulletin Société Géologique de France, ser. 4, vol. 14, p. 147, pl. 4, fig. 1.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.26\text{–}0.34 \text{ mm.} \\ lo = 0.28 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.40\text{–}0.48 \text{ mm.} \\ lz = 0.24\text{–}0.26 \text{ mm.} \end{array}\right.$

Variations.—Our specimens agree with the figures given by Hincks in 1880 and by Busk in 1859. The variety with large gymnocyst noted by Waters in 1900 probably constitutes a distinct species, perhaps identical with *Membranipora arcuata* Canu, 1908, from the Post-Pampean of Argentina.

This species extends scarcely beyond the Tropics and it has remained fixed in the Frigid and Temperate Zones. Its occurrence in the Pliocene of South Carolina indicates a great contraction of the equatorial zone and the position of the Tropic of Cancer toward the thirty-third parallel. Other species confirm this phenomenon.

There are 10 tentacles according to Waters.

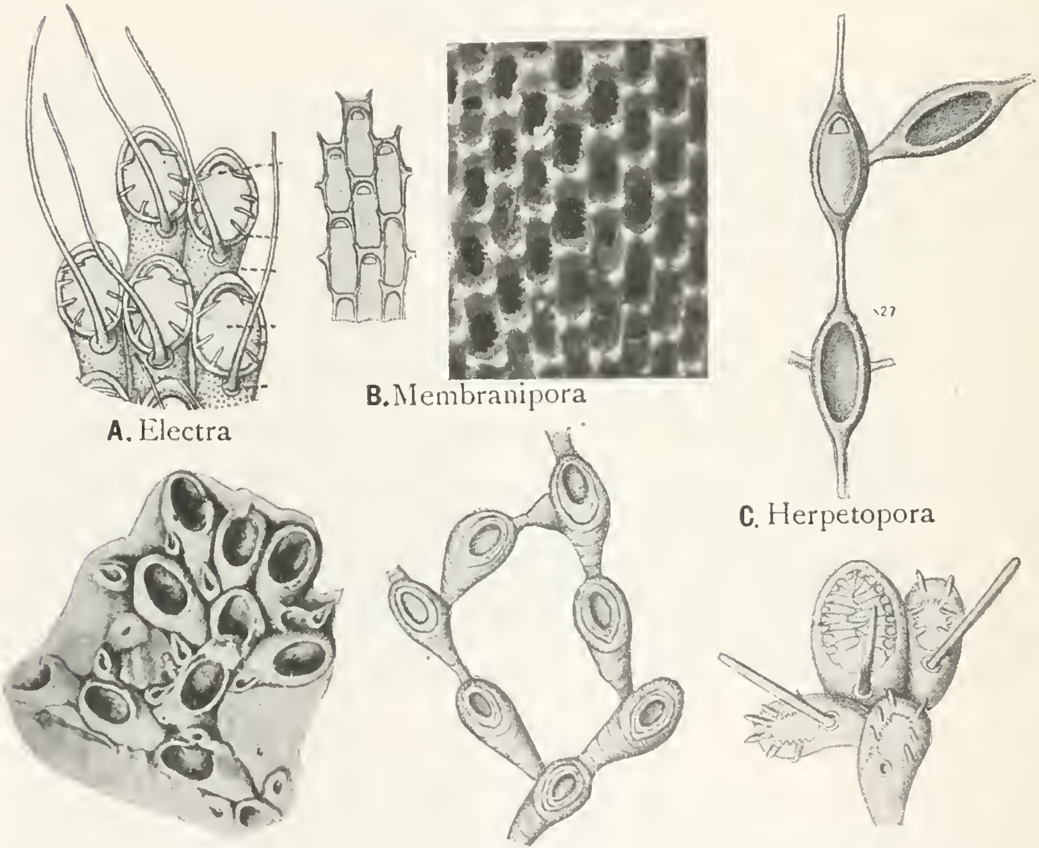
Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare). Pleistocene: Santa Barbara, California (very rare); Waies Bluff, near Cornfield Harbor, St. Marys County, Maryland (rare).

Geological distribution.—Stampian, environs of Paris (Canu); Helvetian of Touraine (Collection Canu); Astian of England (Busk).

Habitat.—Arctic Ocean: Franz Josef Land (16–205 meters) (Waters), Barentz Sea. Eastern Atlantic: English Channel, North Sea off Germany, Denmark, England, Norway (19–24 meters), Gulf of Gascony (17–180 meters), mouth of the Tagus, Cape Verde Islands. Western Atlantic: Woods Hole (3–30 meters), Panama.

This species lives principally at the mouth of streams and large rivers.

Plesiotypes.—Cat. Nos. 68396–68398, U.S.N.M.



A. Electra **B.** Membranipora **C.** Herpetopora **D.** Mystriopora **E.** Pyripora **F.** Heterooecium

FIG. 1.—Genera of the family Electrinidae D'Orbigny, 1851.

A. *Electra* Lamouroux, 1816. *E. pilosa* Linnaeus, 1758, × 46. Recent.

B. *Membranipora* Blainville, 1834. *M. membranacea* Linnaeus, 1758, × 15 (left) and *M. tuberculata* Bosc, 1802, × 20. Recent.

C. *Herpetopora* Lang, 1914. *H. anglica* Lang, 1914, × 27. Cretaceous (after Lang, 1914).

D. *Mystriopora* Lang, 1915. *M. möckleri* Lang, 1915, × 26. Cretaceous of England.

E. *Pyripora* D'Orbigny, 1852. *P. catenularia* Jameson, 1914, × 25. Recent. (A E., after Hincks, 1880.)

F. *Heterooecium* Hincks, 1892. *H. amplectens* Hincks, 1892, × 55. Recent. (After Levinsen, 1909.)

Genus PYRIPORA D'Orbigny, 1852.

(For description see Bulletin 106, U. S. National Museum, p. 78.)

PYRIPORA BREVICAUDA, new species.

Plate 9, figs. 2–4.

Description.—The zoarium encrusts Cellepore bryozoa. The zooecia are pyriform, little narrowed behind, elongated, distinct, separated by a furrow; the gymnocyst is convex and very short. The opesium is elliptical or oval, anterior.

Measurements.[3]—Opesia $\left\{\begin{array}{l} ho = 0.20 \text{ mm.} \\ lo = 0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.40 \text{ mm.} \\ lz = 0.22 \text{ mm.} \end{array}\right.$

Variations.—This small species is of a disconcerting irregularity, especially since the substratum itself is very irregular. The calcified zooecia bear a large elliptical pore. The heterozooecia are numerous and generally fusiform. The zoarial expansions appear to be flabelliform.

Occurrence.—Miocene: Kuhns, Carteret County, North Carolina (rare).

Cotypes.—Cat. No. 68399, U.S.N.M.

Genus MYSTRIOPORA Lang, 1915.

1915. *Mystriopora* LANG, New Uniserial Cretaceous Cheilostome Polyzoa, Geological Magazine ser. 6, vol. 2, p. 502.

MYSTRIOPORA (?) AREOLATA, new species.

Plate 33, figs. 1, 2.

Description.—The zoarium is incrusting. The zooecia are distinct, separated by a deep furrow, elongated, pyriform; the gymnocyst is short, convex, smooth, much narrowed. The mural rim is thin, garnished all around with hollow spines; the opesium is large, oval, anterior; between the zooecia are some zooeciules whose opesium is also garnished with some spines. The zooecia are separated from each other by rectangular *areolar* spaces. Dietellae are present.

Measurements.[3]—Opesia $\left\{\begin{array}{l} ho = 0.45 \text{ mm.} \\ lo = 0.25 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.60 \text{ mm.} \\ lz = 0.50 \text{ mm.} \end{array}\right.$

Affinities.—The Cretaceous genus *Mystriopora* Lang, 1915, shows also zooeciules (although the English authors thought them to be more in the nature of avicularia) and areal spines, but it did not have areolar spaces between the zooecia. Our specimens appear, therefore, to belong to a new genus, although we prefer to employ Lang's name provisionally because the rarity of specimens has not permitted us to make a tangential section in order to discover the dietellae and to establish the nature of the areolar spaces. We have observed cases of double and triple regeneration of the polypide.

This species differs from *Membranipora pedunculata* Hincks, 1881, also provided with zooeciules, by the absence of spines and by the presence of areolar spaces.

Occurrence.—Pleistocene: Santa Monica (Long Wharf Canyon), California (rare).

Cotypes.—Cat. No. 68400, U.S.N.M.

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[3] In the citation of measurements *ho* is the length and *lo* the width of the opesia, *Lz* and *lz* similarly the length and width of the zooecia, *Lv* and *lv* the same for the vibraculum, *Lon* and *lon* for the onychocellaria, *ha* and *la* for the apertura, etc.

Genus MEMBRANIPORA Blainville, 1834.

(For description see Bulletin 106, U. S. National Museum, p. 77.)

MEMBRANIPORA FLABELLATA Canu, 1904.

Plate 10, figs. 10–14.

1904. *Membranipora flabellata* CANU, Les Bryozoaires du Patagonien echelle des Bryozoaires pour les terrains tertiares, Memoires Société Géologique de France, Paleontologie, vol. 12, p. 7, pl. 1, fig. 8.

1908. *Membranipora flabellata* CANU, Iconographie des Bryozoaires fossiles de l'Argentine, Anales del Museo Nacional de Buenos Aires, vol 17, p. 249, pl. 1, figs. 1–5.

Measurements.—Opesia $\begin{cases} ho = 0.26 \text{ mm.} \\ lo = 0.16 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.36\text{–}0.40 \text{ mm.} \\ lz = 0.26 \text{ mm.} \end{cases}$

Structure.—The zoarium incrusts shells and algae over large surfaces forming many superposed lamellae. The tubercles of the interzooecial angles are well preserved only on the inner lamellae, the outermost lamellae being deprived of them. The zooecia are very deep, the mural rim is quite thick, and the opesium is crenulated. The superior lamellae are formed of zooecia developed around pseudoancestrulae. The latter do not arise from the development of a larva, but they are produced by the gemmation of an inferior zooecium.

Variations.—One of our species from Yorktown, Virginia, is exactly similar to the typical Argentina specimens, but our other examples present variations not noted in the types. The variations are due evidently to the diversity of conditions under which the species existed, as its geographic distribution appears very great.

The tubercles are very inconstant (fig. 10) and entire colonies are deprived of them (fig. 12). The young zooecia have thin mural rims (fig. 12) which gives them an aspect similar to that of *Acanthodesia savarti* Audouin, 1826, but old zooecia are normal and there are never large zooecia giving rise to new rows. Sometimes the two distal tubercles are joined together (fig. 13). The tubercles are often replaced by interopesial cavities (fig. 11) on the much expanded zoaria, but the presence of normal tuberose zooecia reveals the true nature of these sorts of specimens.

Affinities.—The exterior aspect much recalls *Acanthodesia oblongula* Ulrich and Bassler, 1904, but the present species differs in its smaller measurements ($ho < 0.30$ mm.) in the absence of opesial spicules and in its multilamellar colonies.

Occurrence.—Miocene (Yorktown formation): Yorktown, Bellfield and Suffolk, Virginia (rare). Miocene (Duplin marl): 2½ miles northwest of Chocowinity and at Snow Hill, North Carolina (rare).

Geological distribution.—Patagonian, Pampean and Post Pampean of Argentina (Canu).

Plesiotype.—Cat. Nos. 68401, 68402, U.S.N.M.

MEMBRANIPORA FOSSILIFERA Ulrich and Bassler, 1904.

Plate 9, figs. 6, 7.

1904. *Membranipora fossulifera* ULRICH and BASSLER, Bryozoa, Maryland Geological Survey, Miocene, p. 408, pl. 110, fig. 1.

The original description is as follows:

> *Description.*—Zoarium forming a thin expansion upon foreign bodies. Zooecia oblong, subquadrate, sometimes obscurely hexagonal, arranged in regular longitudinal and diagonally intersecting rows, with about 11 in 5 mm., measuring lengthwise, 9 to 10 in 3 mm., diagonally, and 11 to 13 of the longi-

tudinal rows in 3 mm. Opesium elongate oval, generally about twice as long as wide. Walls nearly always a little less than half the width of the opesium, with a median channel, the ring-like elevation enclosing the opesium uniformly elevated except across the anterior end where it is higher and obliquely arched and elevated beneath, probably to form a cover for an ooecium, and is usually surmounted by a transverse rib terminating at each end in a small rounded prominence. Rarely the space of an ordinary zooecium is taken up by a cell having a thicker wall and a smaller aperture varying from elongate to nearly circular, while in one instance, a small cell with an oblique opening, narrowed distally, is wedged in between three zooecia.

Measurements.—Opesia $\begin{cases} ho = 0.36 \text{ mm.} \\ lo = 0.20 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50 \text{ mm.} \\ lz = 0.32 \text{ mm.} \end{cases}$

Variations.—Our micrometric measurements represent the average; in reality as in all the Membranipores the variations are considerable. The mural rim is always somewhat wider in the proximal portion; the separating furrow is deep; the opesium is finely crenulated. The two distal tubercles are placed generally on the termen of the mural rim, but frequently they are attached to the exterior slope and appear there as inserted in the interzooecial angles. We have not yet discovered regenerated zooecia.

We present a new photograph of the type of this species which brings out the surface ornament and especially the tubercles more clearly. The species has resemblance to both *Conopeum* and *Membranipora*, but the apparent absence of the two impressions on the dorsal wall of the zooecium, characteristic of *Conopeum*, and the presence of the spines of *Membranipora* cause us to refer the species to *Membranipora* in its restricted sense.

Occurrence.—Miocene (Calvert formation): Reed's, Maryland (very rare). Miocene: Kuhns, Carteret County, North Carolina (rare).

Plesiotype.—Cat. No. 68403, U.S.N.M.

MEMBRANIPORA SPICULATA, new species.

Plate 9, fig. 1.

Description.—The zoarium encrusts species of *Cellepora*. The zooecia are distinct, separated by a deep furrow, elliptical, elongated; the mural rim is thin, salient, flat, bearing two distal tuberosities and two pairs of lateral spicules which are conical and very salient. The opesium is of the same form as the zooecium.

Measurements.—Opesia $\begin{cases} ho = 0.32 \text{ mm.} \\ lo = 0.18 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.40 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{cases}$

Affinities.—In its lateral spicules this species has much resemblance to *Spiralaria denticulata* Busk, 1852, but it differs from it in the absence of an endozooecial ovicell and in the presence of two lateral pairs of spicules. *Hincksina serrata* MacGillivray, 1881, also has a similar aspect, but in the present species we have not observed either the ovicell or interzooecial avicularia. The spicules are rarely erect; they are more or less curved in the form of a claw. The distal tuberosities are often transformed into spicules. It is therefore rather probable that this species bears an ovicell. But a single specimen has been found.

Occurrence.—Miocene: Kuhns, Carteret County, North Carolina (rare).

Holotype.—Cat. No. 68404, U.S.N.M.

MEMBRANIPORA LACROIXII Audouin, 1826.

Plate 29, fig. 4.

1826. *Flustra lacroixii* Audouin, Explication des planches de Polypes de l'Egypte. . . . In Savigny's Description de L'Egypte, Historie Naturelle, vol. 1, 1809, pt. 3, p. 240, pl. 10, fig. 9 (not Busk, Hincks, Canu).

Measurements.—Ordinary zooecia: Opesia $\begin{cases} ho = 0.40 \text{ mm.} \\ lo = 0.22 \text{ mm.} \end{cases}$

Zooecia $\begin{cases} Lz = 0.50 \text{ mm.} \\ lz = 0.32\text{–}0.34 \text{ mm.} \end{cases}$

First zooecia of a row:

Opesia $\begin{cases} ho = 0.40 \text{ mm.} \\ lo = 0.24\text{–}0.28 \text{ mm.} \end{cases}$

Zooecia $\begin{cases} Lz = 0.50\text{–}0.56 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{cases}$

Variations.—The mural rim is flat and finely striated. There is a constant tubercle at each interzooecial angle. The zooecium giving rise to two or more series is much larger. Our specimen is exactly like Audouin's figure of 1826.

Affinities.—Years ago Waters noted that the *Membranipora lacroixi* of Busk and Hincks was probably not Audouin's species. Canu, sharing this opinion, has carefully revised the synonymy.[4] The unexpected discovery in America of Andouin's species confirms therefore the idea of both Waters and Canu. There is no necessity of a new name, since our specimen appears to indicate *Membranipora* more than *Conopeum*.

This species differ from *Membranipora fossulifera* Ulrich and Bassler, 1904, in the presence of tubercles at the interzooecial angles. It is much larger than *Biflustra savarti* Smitt, 1872, which belongs moreover to another genus.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare).

Habitat.—Red Sea or Mediterranean (Audouin).

Plesiotype.—Cat. No. 68405, U.S.N.M.

MEMBRANIPORA TUBERCULATA Bosc, 1802.

Plate 33, figs. 3–5.

1802. *Flustra tuberculata* Bosc, Histoire naturelle des Vers, vol. 3, p. 118.

1839. *Flustra tehuelca* D'Orbigny, Voyage dans l'Amerique-Méridionale, vol. 5, pt. 4, Zoophytes, p. 17, pl. 8, fig. 10–14.

1858. *Membranipora tuberculata* Busk, Zoophytology: On some Madeiran Polyzoa, Quarterly Journal of Microscopical Science, vol. 6, p. 126, pl. 18, fig. 4.

1898. *Membranipora tehuelca* Waters, Observations on Membraniporidae, Journal of the Linnean Society, Zoology, vol. 26, p. 674, pl. 48, fig. 6–8.

1908. *Membranipora tehuelca* Robertson, The incrusting Cheilostomatous Bryozoa of the West Coast of North America, University of California Publications, Zoology, vol. 4, no. 5, p. 265, pl. 15, fig. 16, 17; pl. 16, fig. 18.

1909. *Membranipora tuberculata* Norman, The Polyzoa of Madeira and neighboring Islands, Journal Linnean Society London, Zoology, vol. 30, p. 286.

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[4] See North American Early Tertiary Bryozoa, p. 89.

1911. *Membranipora tehuelca* Guerin-Ganivet, Contributions a l'etude des Bryozoaires des cotes Armoricaines II, Bryozoaires provenant de la rade de Brest, et recueilles par les freres Crouan, Travaux scientifiques du Laboratoire de Zoologie de Concarneau, vol. 3, fasc. 5, p. 6, fig. 3.

1912. *Membranipora tehuelca* Osburn, The Bryozoa of the Woods Hole Region, Bulletin Bureau Fisheries, vol. 30, 1910, p. 231, pl. 24, fig. 40.

We agree with Norman that this species is indeed that of Bosc, who indicated it as very abundant on the algae of the Sargossa Sea. These algae, swept along by the equatorial current, have transported to America a considerable number of European species. This particular one has made the tour of America. One of our fossil specimens still retains its ectocyst and its corneous opercular valve.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (rare).

Habitat.—Eastern Atlantic off France, Senegal, Madeira, and Angola. Western Atlantic: United States, Chagos Isles, Pernambuco, Rio Janeiro, Patagonia. Pacific: Kursachee and California.

Plesiotype.—Cat. No. 68406, U.S.N.M.

MEMBRANIPORA VAUGHANI Canu and Bassler, 1919.

Plate 2, fig. 1.

1919. *Membranipora vaughani* Canu and Bassler, Geology and paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 77, pl. 2, fig. 1.

Description.—The zoarium incrusts shells. The zooecia are little distinct, united among themselves by their mural rim, elongated, hexagonal; the mural rim is flat, granular, everywhere of equal width. The opesium is elliptical or oval, finely crenulated. Between the zooecia at the angles of junction large rounded tubercles occur.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.32-0.36 \text{ mm.} \\ lo=0.22-0.24 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.40-0.44 \text{ mm.} \\ lz=0.32 \text{ mm.} \end{array}\right.$

Affinities.—A single specimen has been found and its zooecia are somewhat deformed by the substratum. The species differs from *Membranipora tuberculata* Busk, 1859, from the English Crag in its much larger micrometric measurements. It differs from *Membranipora tuberculata* Bosc, 1802 (not Busk, 1859) in the much more reduced and very different form of its interzooecial tuberosites.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (very rare).

Holotype.—Cat. No. 68407, U.S.N.M.

MEMBRANIPORA(?) TUBERIMARGO, new species.

Plate 9, fig. 12.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, elongated, elliptical. The mural rim is thin, rounded, a little enlarged at the base; it bears one pair of distal and two pairs of lateral tuberosities. The opesium is large, anterior, elliptical.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.40-0.45 \text{ mm.} \\ lo=0.25-0.30 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.45 \text{ mm.} \\ lz=0.35-0.40 \text{ mm.} \end{array}\right.$

Variations.—Our micrometric measurements have been made as far as possible from the ancestrula on our single specimen. The opesium of the small ancestrular zooecia measures only 0.30 by 0.20 mm. The number and size of the tubercles is very irregular. They are hollow.

This species differs from *Membranipora osburni* in its larger dimensions, and in the presence of two pairs of lateral tuberosities.

Occurrence.—Miocene (St. Mary's formation): Cove Point, Maryland (very rare).

Holotype.—Cat. No. 68408, U.S.N.M.

MEMBRANIPORA OSBURNI, new species.

Plate 46, figs. 11, 12.

Description.—The zoarium incrusts sponges. The zooecia are distinct, separated by a furrow, elongated hexagonal; the mural rim is thin, rounded, very finely crenulated, salient, ornamented with two distal tubercles; the proximal cryptocyst is concave and very small. The opesium is elliptical.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.30 \text{ mm.} \\ lo = 0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.35 \text{ mm.} \\ lz = 0.28 \text{ mm.} \end{array}\right.$

Affinities.—The micrometric measurements are smaller than *Membranipora vaughani*, but the species is quite close to *Membranipora tuberculata* Busk, 1859, in its two distal tubercles. It is distinguished from the latter by its cryptocyst placed only in the proximal portion of the zooecium, by its larger micrometric measurements ($Lz = 0.35$ mm. and not 0.30 mm.), and in its much thinner mural rim.

We dedicate this interesting species to Dr. Raymond C. Osburn, of the Ohio State University, in honor of his important researches upon American recent bryozoa.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (rare). Miocene (Bowden marl): Bowden, Jamaica (rare).

Holotype.—Cat. No. 68409, U.S.N.M.

Group MEMBRANIPORAE Canu and Bassler, 1917.

SECTION I. NO OVICELL.

Genus MEMBRANIPORINA Levinsen, 1909.

(For description see Bulletin 106, U. S. National Museum, p. 94.)

MEMBRANIPORINA TENELLA Hincks, 1880.

Plate 5, figs. 10, 11.

1880. *Membranipora tenella* Hincks, Contributions History Marine Polyzoa, Foreign Membraniporina II, Annals Magazine Natural History, ser. 5, vol. 6, p. 376, pl. 16, fig. 7.

1889. *Membranipora tenella* Jelly, Synonymic catalogue of recent marine Bryozoa, p. 167.

1919. *Callopora tenella* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication of the Carnegie Institution at Washington, No. 291, p. 81, pt. 5, fig. 10.

Affinities.—This species is quite easily recognized by its very thin mural rim and especially by its small tubercles arranged more or less symmetrically on the gymnocyst. These tubercles appear to be hollow.

The species may perhaps be confused with *Callopora dumerilli* Savigny-Audouin, 1826, in which the exterior aspect is quite similar; it differs from it in the presence of nodules instead of avicularia placed on the gymnocyst (and not between the opesia).

Occurrence.—Lower Miocene (Bowden marl): Bowden, Jamaica (rare).

Habitat.—Florida (Hincks).

Plesiotypes.—Cat. No. 68410, U.S.N.M.

MEMBRANIPORINA BACCATA, new species.

Plate 9, fig. 14.

Description.—The zoarium is incrusting, unilamellar. The zooecia are distinct, separated by a deep furrow, much elongated, elliptical or irregular. The mural rim is thin, regular, salient, rounded, covered with large granules. The opesium has the same form as the zooecium.

Measurements.—Opesia $\begin{cases} ho = 0.50 \text{ mm.} \\ lo = 0.22 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.60 \text{ mm.} \\ lz = 0.35 \text{ mm.} \end{cases}$

Variations.—The zooecia giving rise to new series are much larger; they are numerous, and when the zoarium is not perfectly regular the smaller zooecia which they emit have not sufficient place for development and thus become deformed.

We have noted traces of spicules, so that this species could possibly belong to the genus *Acanthodesia.* However, it is imprudent to pronounce on this point from a single specimen. The ensemble of the large granules of the mural rims give to this species the aspect of a chain of *pearls.*

Occurrence.—Miocene (St. Mary's formation): Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia (rare).

Holotype.—Cat. No. 68411, U.S.N.M.

MEMBRANIPORINA CALIFORNICA Gabb and Horn, 1862.

Plate 33, fig. 6.

1862. *Membranipora californica* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences of Philadelphia, ser. 2, vol. 5, p. 160, pl. 20, fig. 46.

The original description is as follows:

> Colony encrusting, cellules arranged in lines, not always in regular quincunx. Cellules pyriform, sometimes continued behind, often abruptly truncated. Opening large, occupying two-thirds or more of the cellules; varying from rounded triangular to oval, usually narrowest in front, never sharply acuminate. Surface sometimes rounded about the oval opening, at others carinate, midway between the aperture and the margin of the cellule, from which line the surface slopes downwards, convexly in both directions. Behind the opening the surface is convex, often narrow. No abortive cellules nor ovarian vescicles were observed.

We have been unable to find specimens of this species and we therefore reproduce the original description and figures for the benefit of future students.

Occurrence.—Pleistocene: Santa Barbara, California.

MEMBRANIPORINA VINCULARINA, new species.

Plate 9, figs. 8–10.

Description.—The zoarium is free, vincular, formed of two lamellae back to back, composed of four to eight longitudinal rows of zooecia. The zooecia are elliptical, distinct, separated by a deep furrow; the mural rim is wide, rounded, tuberose somewhat wider in the proximal portion; the opesium is regular, elongated, elliptical.

Measurements.—Opesia $\begin{cases} ho = 0.24\text{–}0.32 \text{ mm.} \\ lo = 0.14\text{–}0.16 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.40\text{–}0.50 \text{ mm.} \\ lz = 0.30\text{–}0.36 \text{ mm.} \end{cases}$

Affinities.—We have not yet discovered an ovicell on any of our specimens. The quadrangular zoaria have much resemblance to *Farcimia*, but their zooecia are identical with those of the multiserial colonies.

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare). Miocene (Yorktown formation): 3 miles southwest of Petersburg, Virginia (very rare).

Cotypes.—Cat. Nos. 68412, 68413, U.S.N.M.

Genus CONOPEUM Norman, 1903.

(For description see Bulletin 106, U. S. National Museum, p. 86.)

CONOPEUM LACROIXII Busk, 1852.

Plate 1, fig. 6.

1919. *Conopeum lacroixii* Canu and Bassler, Monograph Early Tertiary Bryozoa of North America, Bull. 106, U. S. National Museum, p. 89, pl. 13, fig. 9. (Bibliography, history and distribution.)

Measurements.—Opesia $\begin{cases} ho = 0.40 \text{ mm.} \\ lo = 0.20 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50 \text{ mm.} \\ lz = 0.28 \text{ mm.} \end{cases}$

Although we have had the good fortune to discover the true *Membranipora lacroixii* Audouin, 1826 (see p. 22, pl. 29, fig. 4), it is evident that the present species ought henceforth to be classed under Busk's name of 1852. We have no new observations to add to our previous description of this species, for the Miocene specimens are very rare.

Occurrence.—Miocene (St. Mary's formation): Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia (rare). Miocene (Calvert formation): Reeds, Maryland (rare). Miocene (Bowden marl): Bowden, Jamaica (rare).

Plesiotype.—Cat. No. 68414, U.S.N.M.

CONOPEUM OVALE Canu and Bassler, 1919.

Plate 5, fig. 6.

1919. *Conopeum ovale* Canu and Bassler, Geology and Paleontology of the West Indies Bryozoa, Pub. Carnegie Institution of Washington, No. 291, p. 77, pl. 5, fig. 6.

Description.—The zoarium incrusts shells. The zooecia are distinct, elongated, oval, the point above, separated by a deep furrow; the mural rim is thin, oblique, flat; the opesium is entire, oval. There are two orbicular impressions at the base of the zooecia. The interopesial cavities are irregular and rare.

Measurements.—Opesia $\begin{cases} ho = 0.30 \text{ mm.} \\ lo = 0.15 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.35 \text{ mm.} \\ lz = 0.25 \text{ mm.} \end{cases}$

Affinities.—The primoserial zooecia are small and calcified. The figured specimen alone has been found. We know no equatorial species with which to compare the present one.

Occurrence.—Lower Miocene (Bowden marl): Bowden, Jamaica (very rare).

Holotype.—Cat. No. 68415, U.S.N.M.

CONOPEUM GERMANUM Ulrich and Bassler, 1904.

Plate 10, fig. 8.

1904. *Membranipora germana* Ulrich and Bassler, Bryozoa: Maryland Geological Survey, Miocene, p. 410, pl. 111, fig. 29.

The original description is as follows:

> Zoarium forming a delicate crust upon foreign bodies, the largest seen being less than 1 cm. in diameter. Zooecia shallow, arranged in curved radiating lines in which about 6 occur in 3 mm.; measuring transversely, 11 to 12 of the rows in the same space. Opesia large, more or less elongate-ovate, the length and width usually as 3 is to 2, separated laterally from their neighbors by about half their width, enclosed by a ring-like thickening formed by a furrow separating adjoining zooecia. At somewhat irregular intervals, the interzooecial space widens and is occupied by a rounded cell that may have lodged some kind of avicularium. These cells vary greatly in size but are always considerably smaller than the true zooecia. Occasionally the front margin of the zooecium is more elevated than the rest of the circumference. No ovicells observed.

The description quoted above gives all the essential features of this species.

Occurrence.—Miocene (St. Mary's formation): Cove Point, Maryland (very rare). Miocene (Choptank formation): Dover Bridge, Maryland (very rare).

Holotype.—Cat. No. 68416, U.S.N.M.

CONOPEUM? NITIDULUM Ulrich and Bassler, 1904.

Plate 9, fig. 5.

1904. *Membranipora nitidula* Ulrich and Bassler, Bryozoa: Maryland Geological Survey, Miocene, p. 412, pl. 112, fig. 1.

The original description is as follows:

> Zoarium apparently erect, bifoliate. Zooecia oblong, subquadrate, the length twice the width, arranged rather regularly in longitudinal and diagonally intersecting series, rarely four, usually five in three mm. lengthwise, about seven diagonally, and ten or eleven transversely in the same space. Opesia elongate-elliptical, separated transversely by an obtusely ridge-shaped wall generally equalling about half their width; longitudinal interspaces about twice as great as the transverse, medially ridged with a crescentic ovicellar excavation below (that is, in front of each opesium) and usually a small pore-like depression at each end of the ridge. Very minute spines or granules on inner slope of walls.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.45 \text{ mm.} \\ lo = 0.22\text{–}0.25 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.60 \text{ mm.} \\ lz = 0.25\text{–}0.30 \text{ mm.} \end{array}\right.$

Affinities.—A restudy of the type specimen shows that the original illustration of the species was inverted. At the bottom of each zooecium there is a small flat cryptocyst more or less developed. The interopesial spaces are triangular. The opesium is finely crenulated.

This species is very close to *Conopeum lacroixii* Authors, but it differs in its larger micrometric measurements and in the presence of a small proximal cryptocyst. Nevertheless, as the figured example alone has been found, we can not affirm the constancy of this latter characteristic.

Occurence.—Miocene (Choptank formation): Pawpaw Point, Maryland (rare).

Holotype.—Cat. No. 68417, U.S.N.M.

CONOPEUM BARBARENSIS Gabb and Horn, 1862.

Plate 33, figs. 7–9.

1862. *Membranipora barbarensis* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences of Philadelphia, ser. 2, p. 60, pl. 20, fig. 47.

Description.—The zoarium incrusts bryozoa. The zooecia are distinct, irregular, elliptical or oval; the mural rim is thin, flat, trenchant; the opesium is large, elliptical or oval. The axis of the avicularium is always in the axis of the proximal zooecium.

Measurements.—Opesia $\begin{cases} ho = 0.32 \text{ mm.} \\ lo = 0.16 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.40 \text{ mm.} \\ lz = 0.28 \text{ mm.} \end{cases}$

Affinities.—There are two muscular impressions as in the genus *Conopeum*. The avicularium (?) is not constant; it only appears from place to place; it is elliptical. We are not certain of its nature for only the figured specimens have been found.

This species differs from *Ellisina* (*Membranipora*) *levata* Hincks, 1882, from the Queen Charlotte Islands, in its thinner mural rim, and in the avicularium, always placed in the axis of the proximal zooecium (and not in all directions).

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Plesiotypes.—Cat. No. 68418, U.S.N.M.

Genus CUPULADRIA Canu and Bassler, 1919.

1919. *Cupuladria* Canu and Bassler, The Geology and Paleontology of the West Indies, Bryozoa, Publications Carnegie Institution of Washington, No. 291, p. 77.

No ovicell. The zoarium bears vibracula. No gymnocyst.

Genotype.—*Cupuladria* (*Cupularia*) *canariensis* Busk, 1859. Range: Miocene-Recent.

The genotype does not belong at all to *Cupularia* as we now understand this genus and as it is defined by its type species. There are neither opesiules nor cryptocyst. Previously, Smitt in 1872 classified the genotype more correctly in *Membranipora* as this genus was then understood. It can not, however, be maintained in this genus since its significance has been more restricted. We were therefore obliged to create the new genus characterized by the presence of vibracula, although these organs of zoarial adaptation may not logically furnish good generic characters. We only add a letter to the primitive term to modify the long synonymy of this species as little as possible.

This genus differs from *Heliodoma* Calvet, 1907, in the absence of a gymnocyst. The absence of an endozooecial ovicell does not permit it to be confused with either *Vibracellina* Canu and Bassler, 1917, or *Setosellina* Calvet, 1907.

CUPULADRIA CANARIENSIS Busk, 1859.

Plate 1, figs. 7–9.

1859. *Cupularia canariensis* Busk, Monograph fossil Polyzoa of the Crag, Publications Paleontographical Society, London, vol. 14, p. 87, pl. 13, fig. 2.

1872. *Membranipora canariensis* Smitt, Floridan Bryozoa, collected by Count L. F. de Pourtales, pt. 1, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 10, No. 11, p. 10.

1908. *Cupularia canariensis* Canu, Iconographie des Bryozoaires fossiles de L'Argentine, Anales del Museo Nacional de Buenos Aires, vol. 17, p. 275, pl. 5, figs. 8–10 (gives bibliography).

1909. *Cupularia guineensis* Norman, The Polyzoa of Madeira and neighboring Islands, Journal Linnean Society London, Zoology, vol. 30, p. 289, pl. 37, figs. 2–6.

1913. *Cupularia canariensis* Canu, Contributions a l'etude des Bryozoaires fossiles, IV, Pliocene d'Alger, Bulletin Société Géologique de France, ser. 4, vol. 13, pp. 124, 128.

1914. *Cupularia guiniensis* Osburn, The Bryozoa of the Tortugas Islands, Florida, Publication Carnegie Institution of Washington, No. 182, p. 194.

1916. *Cupularia canariensis* Canu, Bryozoaires fossiles des Terraines du Sud-Ouest de la France, 9, Aquitanien, Bulletin de la Société Géologique de France, ser. 4 vol. 16, p. 137, pl. 3, figs. 4–6.

1919. *Cupuladria canariensis* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication Carnegie Institution of Washington, no. 291, p. 78, pl. 1, figs 8–10.

This abundant, well-known fossil and recent species, distinguished by its free, cupuliform zoarium with the zooecia on the convex side having a membraniporoid opesium and vibracula and with the concave side marked by distinct polygonal areas pierced by a few large pores, has been found fossil at number of American localities starting in the Lower Miocene and continuing to the present time. In its geological occurrence it agrees with *Cupularia umbellata* Defrance, 1823, which likewise begins in the Lower Miocene.

Occurrence.—Lower Miocene (Chipola marl): 1 mile below Baileys Ferry, Chipola River, Florida (rare). Lower Miocene (Bowden horizon): Bowden, Jamaica (rare); Rio Gurabo, Rio Cana, and Cercado de Mao, Santo Domingo (rare); and Port Limon, Costa Rica (common). Lower Miocene (Gatun formation): Banana River, Costa Rica (rare). Miocene (Choctowatchee marl) Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare). Pliocene (Caloosahatchee marl): Monroe County, Florida (rare).

Geological distribution.—Burdigalian of Bordeaux (Canu collection); Helvetian of France (Canu) and Spain (DeAngelis); Tortonian of Austria-Hungary (Reuss) and Italy (Seguenza); Plaisancian of Italy (Manzoni), England (Busk), Spain (DeAngelis) and Algeria (Canu); Astian of Italy (Neviani, Canu); Sicilian of Rhodes (Manzoni) and Italy (Neviani); Quaternary of Italy (Neviani) and Argentina (Canu); Miocene of Australia? (Waters).

Plesiotypes.—Cat. No. 68419–68424, U.S.N.M.

CUPULADRIA BIPOROSA, new species.

Plate 47, figs. 1, 2.

Description.—The zoarium is orbicular. The zooecia are distinct, large, elongated or transverse, large or small, generally rhomboidal; the opesium is regular, oval, variable in form in the wide zooecia. The interzooecial vibraculum is very large and auriculate. On the inner face the zooecia are rectangular and each one bears *two* large *pores*.

Affinities.—This interesting new species differs from *Cupuladria canariensis* Busk, 1852, in its larger zooecia, which bear on the inner face only two large pores.

It is also very well characterized by the presence of wider zooecia in the vicinity of the zoarial margins.

Occurrence.—Miocene (Bowden marl): Santo Domingo.

Cotypes.—Cat. No. 68425, U.S.N.M.

Genus ACANTHODESIA Canu and Bassler, 1919.

1919. *Acanthodesia* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, No. 291, p. 79.

No ovicell. The opesium is garnished laterally by small spinous processes and inferiorly by a serrate denticle. Fifteen tentacles.

Genotype.—*Acanthodesia* (*Flustra*) *savarti* Savigny-Audouin, 1826.

Range.—Lutetian-Recent.

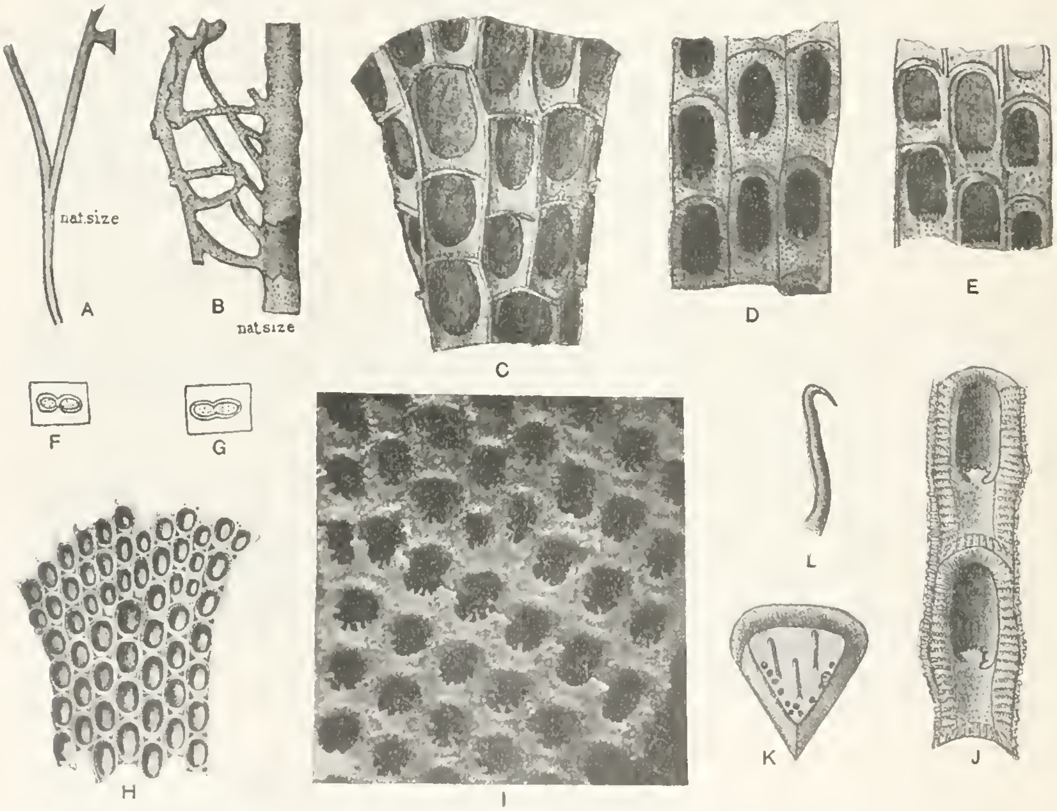

Fig. 2.—Genus *Acanthodesia* Canu and Bassler, 1919.

Figs. A–I. *Acanthodesia savartii* Savigny-Audouin, 1826. A and B. Zoaria of recent specimens natural size. C. Young zooecia, × 25. D. Older zooecia, × 25, showing small proximal denticles. E. Older zooecia, × 25, with a serrate denticle directed inward toward the basal wall. F, G. Distal septular plates, × 250 (A–G, after Waters, 1908). H. Zoarial fragment, × 12 (after Audouin, 1826). I. A fossil specimen, × 20, showing zooecia with spicules.

Figs. J–L. *Acanthodesia* (*Membranipora*) *limosa*, Waters, 1908. J. Two zooecia, × 55. K. Distal wall, × 55, with the peculiar spine-like processes. L. A spine-like process more highly magnified, × 200. (Figs. J–L, after Levinsen, 1909.)

ACANTHODESIA SAVARTI Savigny-Audouin, 1826.

1812. *Flustra savarti* Savigny, Description de l'Egypte, Polypes, pl. 10, fig. 10.
1826. *Flustra savarti* Audouin, Explication sommaire des planches de Polypes de l'Egypte et de la Syrie, p. 240.

The variations in form and size of this species are extraordinary. We group them around some principal forms, but it is evident that the same zoarium may exhibit all of them. These forms are as follows:

1. Forma *typica*. The opesium is crenulated and elongated; the large zooecia have a cryptocyst. The zoarium is incrusting, unilamellar or bilamellar.
2. Forma *texturata*. The cryptocyst is developed on all the zooecia. No areal spines. No tubercles. The zoarium is unilamellar and subcylindrical.
3. Forma *reyti*. The zooecia are irregular. There are areal spines. No cryptocyst. No tubercles. The opesium is denticulated and not crenulated. The zoarium is unilamellar and subcylindrical.
4. Forma *monilifera*. Like *typica*, but the mural rim is beaded. The zoarium is unilamellar and subcylindrical.
5. Forma *delicatula*. The cryptocyst is short. There are areal spines. The zoarium is bilamellar.
6. Forma *bifoliata*. There are areal spines. The opesium is surrounded by a sort of salient collar. The zoarium is bilamellar. Tubercles at the angles.

These various forms and occurrences are noted under the following headings:

ACANTHODESIA SAVARTI forma TYPICA.

Plate 11, figs. 1-3.

The opesium is crenulated and elongated; the large zooecia have a cryptocyst. The zoarium is encrusting, unilamellar or bilamellar.

Our few American specimens are encrusting. The zooecia are less elongated than in the forma *monilifera* and less spinous than the forma *reyti*. The micrometric variations are very great. The granulations are as beautiful as in the other two forms.

Occurrence.—Miocene (St. Mary's formation): Bowler's wharf, Rappahannock River, 18 miles above Urbana, Middlesex County, Virginia (rare). Miocene (Yorktown formation): Near Suffolk Virginia (rare). Pleistocene: Vero, Florida (common).

Plesiotypes.—Cat. No. 68426, U.S.N.M.

ACANTHODESIA SAVARTI forma REYTI Canu, 1909.

1909. *Membranipora reyti* Canu, Les Bryozoaires fossiles des Terraines du Sud-Ouest de la France; III Burdigalien, Bulletin de la Société Géologique de France, ser. 4, vol. 9, p. 443, pl. 15, fig. 2.
1909. *Membranipora savarti* Canu, Les Bryozoaires fossiles des Terraines du Sud-Ouest de la France; III Burdigalien, Bulletin de la Société Géologique de France, ser. 4, vol. 9, p. 444, pl. 15, fig. 3.

Measurements.—Opesia $\begin{cases} ho = 0.34\text{–}0.50 \text{ mm.} \\ lo = 0.20\text{–}0.30 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{cases}$

There are some long and some wide zooecia. The opesium is very finely denticulated and bears areal spines. The mural rim is granulated on the better preserved specimens, which then resemble forma *monilifera* from Cercado de Mao, Santo Domingo. There are in the Canu collection specimens almost as beautiful as the Santo Domingo form.

Occurrence.—Miocene (Aquitanian): Léognan (LeThil), St. Médard-Gajac (Gironde) and St. Avit (Landes), France. Miocene (Burdigalian): Saucats (Le-Peloua), Léognan and Pontiac (Gironde) France.

ACANTHODESIA SAVARTI forma MONILIFERA Canu and Bassler, 1919.

Plate 2, figs. 2, 3.

1919. *Acanthodesia savarti* forma *monilifera* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication of the Carnegie Institution of Washington, No. 291, p. 79, pl. 2, figs. 2, 3.

Like *typica*, but the mural rim is beaded. The zoarium is unilamellar and subcylindrical.

This form is intermediate between forma *reyti* and forma *typica*. It is evidently the first representative in the American Basin.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare.)

Holotype.—Cat. No. 68427, U.S.N.M.

ACANTHODESIA SAVARTI forma TEXTURATA Reuss, 1847.

Plate 5, figs. 1–5; plate 46, figs. 8, 9.

1847. *Flustrellaria texturata* Reuss, Die fossilen Polyparien des Wiener-Tertiärbeckens, Haidinger's naturwissenschaftliche Abhandlungen, vol. 2, p. 73, pl. 9, fig. 1.
1872. *Biflustra savarti* Smitt, Floridan Bryozoa, collected by Count L. F. de Pourtales, Part I, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 10, No. 11, p. 20, pl. 4, figs. 92–95.
1877. *Flustrellaria texturata* Manzoni, I, Briozoi fossili del Miocene d'Austria ed Ungheria, II Parte, Denkschriften der math. natur. Classe der k. Akademie der Wissenschaften, vol. 37, Abtheil. 2, p. 67, pl. 13, fig. 45.
1917. *Acanthodesia savarti* forma *texturata* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication of the Carnegie Institution of Washington, No. 291, p. 79, pl. 5, figs. 1–5.

The cryptocyst is developed on all the zooecia. No spinous processes. No tubercles. The zoarium is unilamellar and subcylindrical.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.35 \text{ mm.} \\ lo=0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50 \text{ mm.} \\ lz=0.28 \text{ mm.} \end{array}\right.$

Variations.—The zoarium incrusts fine algae at their bifurcation; it is therefore unilamellar and subcylindrical. The zooecia are elongated, ogival, distinct; the mural rim is striated, salient only in the distal portion; the cryptocyst is large and concave. The opesium is elliptical, very finely denticulated; anteriorly it often bears thin and short spinous processes.

Smitt figured the serrate denticle on the recent specimens; it never persists on the fossil examples. On the inner face the zooecia are rectangular.

Affinities.—The presence of the spinous processes differentiates our specimens from *Flustrellaria texturata* from the European Tortonian which, according to the figures, does not bear them.

Occurrence.—Lower Miocene (Bowden horizon): Bowden, Jamaica (very common). Pleistocene or Recent: Vero, Florida (rare).

Geologic distribution.—Tortonian of Austria Hungary (Manzoni).

Habitat.—Recent, off Florida (Smitt).

Plesiotypes.—Cat. Nos. 68428, 68429, U.S.N.M.

ACANTHODESIA SAVARTI forma DELICATULA Busk, 1859.

Plate 11, figs. 5–9.

1859. *Biflustra delicatula* Busk, Monograph fossil Polyzoa of the Crag, Publications Paleontographical Society, London, vol. 14, p. 72, pl. 1, figs. 2, 4; pl. 2, fig. 7.

1869. *Biflustra delicatula* Manzoni, Bryozoi fossili italiani, Terza contribuzione, Sitzungsberichte der kaiserlichen Akademie der Wissenschaften, vol. 60, Abtheil. 1, p. 4, pl. 1, fig. 5.

Measurements.—Opesia $\begin{cases} ho = 0.40 \text{ mm.} \\ lo = 0.20 \text{ mm.} \end{cases}$ Zooecia (first of series) $\begin{cases} Lz = 0.60 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{cases}$

Our specimens have very narrow fronds. The mural rim is thick and finely tuberous. The cryptocyst is sometimes short, sometimes long. The traces of spinous processes are quite frequent.

The bilamellar form commences in the Helvetian. The variation with large cryptocyst is abundant in the Mediterranian Pliocene.

Occurrence.—Miocene (Choctawhatchee marl?) Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare). Miocene (St. Marys formation): Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia (rare).

Geologic distribution.—Helvetian of St. Avit and Salles (Gironde), of the faluns of Touraine (Canu collection). Pliocene (Astian) of England (Busk) and of Italy (Manzoni).

Plesiotypes.—Cat. Nos. 68430, 68431, U.S.N.M.

ACANTHODESIA SAVARTI forma BIFOLIATA Ulrich and Bassler, 1904.

Plate 11, fig. 4.

1904. *Membranipora bifoliata* Ulrich and Bassler, Bryozoa, Maryland Geological Survey, Miocene, p. 411, pl. 112, figs. 2, 3, 4.

There are areal spines. The opesium is surrounded by a sort of salient collar. The mural rim is thin. The zoarium is bilamellar. Tubercles at the angles.

This form is much like forma *delicatula* and differs only in the absence of the cryptocyst and in its thin mural rim. The collar-like structure which surrounds the opesium is not constant; it exists sometimes in the unilamellar forms.

Occurrence.—Miocene (Choptank formation): Jones wharf and Cordova, Maryland (common).

Cotypes.—Cat. No. 68432, U.S.N.M.

ACANTHODESIA OBLONGULA Ulrich and Bassler, 1904.

Plate 10, figs. 1–3.

1904. *Membranipora oblongula* Ulrich and Bassler, Bryozoa, Maryland Geological Survey, Miocene, p. 407, pl. 110, figs. 2–5.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow of little depth, elongated, rectangular; the mural rim is rounded, regular, granular, ornamented by two large distal tubercles. The opesium is entire, elliptical, finely denticulated and provided with spicules of greater or less length.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.40 \text{ mm.} \\ lo = 0.15 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.45\text{–}0.50 \text{ mm.} \\ lz = 0.25\text{–}0.30 \text{ mm.} \end{array}\right.$

Variations.—The figures of Ulrich and Bassler are incomplete as the tubercles have not been restored fully enough. On Plate 10 we reproduce a better photograph of the type (fig. 1). Sometimes the tubercles are joined and form a single large distal tuberosity (fig. 2). The micrometric measurements vary according to the specimens and even on the same specimen they are irregular. The zooecia giving rise to a new series are larger according to the rule in the genus.

Affinities.—This species differs from *Membranipora flabellata* Canu, 1904, in the presence of spicules and in the larger micrometric measurements. It differs from *Acanthodesia savarti* Audouin, 1826, in the presence of large distal tubercles.

Occurrence.—Miocene (Calvert formation): Plum Point, Reeds, and Chesapeake Beach, Maryland (common). Miocene (Choptank formation): Jones wharf, Pawpaw Point, Dover Bridge, etc., Maryland (rare).

Plesiotype.—Cat. No. 68433, U.S.N.M.

ACANTHODESIA RECTANGULARIA, new species.

Plate 9, fig. 11.

Description.—The zoarium incrusts oyster shells. The zooecia are distinct, elongated, rectangular; the mural rim is thin, salient; the cryptocyst is deep, short, a little convex. The opesium is large, oval, terminal.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.35 \text{ mm.} \\ lo = 0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.50\text{–}0.55 \text{ mm.} \\ lz = 0.30\text{–}0.35 \text{ mm.} \end{array}\right.$

Affinities.—On certain isolated zooecia we have been able to observe some spines and even traces of the serrate proximal denticle. In spite of appearances of our figure, which is incomplete because of the disappearance of the spines, this species belongs really to the genus *Acanthodesia*. It is well characterized by the rectangular form of its zooecia.

Occurrence.—Miocene (Yorktown formation): 3 miles southwest of Petersburg, Virginia (rare).

Holotype.—Cat. No. 68434, U.S.N.M.

SECTION II. MEMBRANIPORAE WITH ENDOZOOECIAL OVICELL.

Genus VIBRACELLINA Canu and Bassler, 1917.

(For description see Bulletin 106, U. S. National Museum, p. 110.)

VIBRACELLINA PUSILLA, new species.

Plate 10, figs. 4, 5.

Description.—The zoarium incrusts shells. The zooecia are small, oval, a little elongated, distinct, separated by a deep furrow; the mural rim is thin, rounded, salient, much enlarged at the base into a concave cryptocyst. The opesium is anterior, oval, regular. The ovicell is very small and endozooecial. The vibracula are small, salient, elliptical, auricular.

Measurements.—Opesia $\begin{cases} ho=0.14\text{–}0.16 \text{ mm.} \\ lo=0.10 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz=0.30 \text{ mm.} \\ lz=0.14 \text{ mm.} \end{cases}$

Affinities.—According to the rule in this genus, the ancestrular zooecia are smaller and frequently calcified. The ancestrula engenders five normal zooecia and three vibracular ones. In the proximal portion of the zooecia there is often a very short gymnocyst.

This species differs from *Membrendoecium rectum* Canu and Bassler, 1920, from the Vicksburgian in its slightly smaller dimensions, its concave and not flat cryptocyst and in its nonsalient mural rim.

Occurrence.—Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida (very rare). Miocene (Duplin marl): Natural well, 2 miles southwest of Magnolia, North Carolina (rare).

Cotypes.—Cat. Nos. 68435, 68436, U.S.N.M.

VIBRACELLINA SIMPLEX, new species.

Plate 10, figs. 6, 7.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow, elongated, pyriform; the gymnocyst is smooth, convex, rather short; the termen is sharp. The opesium is oval, the point above. The ovicell is very small and endozooecial. The vibracula are rare, very small, auriculated. The ancestrula is calcified and presents a small semilunar aperture.

Measurements.—Opesia $\begin{cases} ho=0.20 \text{ mm.} \\ lo=0.13\text{–}0.15 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz=0.35\text{–}0.40 \text{ mm.} \\ lz=0.25 \text{ mm.} \end{cases}$

Structure.—The rarety of vibracula give to this species an aspect of great *simplicity.* The heterozooecia appear to be zooecia in which the development has been arrested by adjacent zooecia. The ancestrula and three ancestrular zooecia are calcified. The hexagonal symmetry in the arrangement of the ancestral zooecia is remarkable. Nevertheless, there are really only five zooecia issuing from the ancestrula according to the rule, and no vibracula. We have observed calcified zooecia and also regenerated zooecia in vicinity of the ancestrula.

This species differs from *Vibracellina pusilla* in its larger micrometric dimensions and in the very great rarity of the vibracula.

Occurrence.—Miocene (Choctowhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (very rare). Miocene (Duplin marl): Natural well, 2 miles southwest of Magnolia, North Carolina (rare).

Cotypes.—Cat. Nos. 68437, 68438, U.S.N.M.

Genus MEMBRENDOECIUM Canu and Bassler, 1917.

(For description see Bulletin 106, U. S. National Museum, p. 119.)

MEMBRENDOECIUM PARVICAPITATUM, new species.

Plate 12, figs. 1, 2.

Description.—The zoarium encrusts shells. The zooecia are distinct, separated by a deep furrow, elongated, elliptical; the mural rim is thin and rounded. The opesium is of the same form as the zooecium. The ovicell is *very small*, transverse, endozooecial, scarcely salient. A very small triangular avicularium appears sometimes between the zooecia.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.36 \text{ mm.} \\ lo = 0.26 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.44 \text{ mm.} \\ lz = 0.32\text{–}0.34 \text{ mm.} \end{array}\right.$

Variations.—The measurements are very irregular. The regeneration of the polypide is very frequent and our figure shows an ovarian zooecium replaced by an ordinary one. The mural rim is very finely granulated. The small avicularium is quite rare. According to the rule in this genus it is deprived of pivot.

All of the resemblances of this species are with *Callopora guernei*, Jullien, 1904, and it is close to this latter species that we would have to refer the present new species in case additional specimens should show that the small distal elevation of the mural rim is not an endozooecial ovicell.

Occurrence.—Miocene (Choctowhatchee marl); Jackson Bluff, Ocklocknee River 25 miles southwest of Tallahassee, Florida (rare). Miocene (Bowden marl): Bowden, Jamaica (rare).

Holotype and *paratype.*—Cat. Nos. 68439, 68440, U.S.N.M.

MEMBRENDOECIUM GRANDE, new species.

Plate 11, figs. 10–12.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow of little depth, elongated, large, irregular; the mural rim is thin, bevelled, with a sharp termen. The opesium is large, entire, of the same form as the zooecium. The ovicell is endozooecial, small, little salient, transverse.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.56 \text{ mm.} \\ lo = 0.40 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.70 \text{ mm.} \\ lz = 0.50 \text{ mm.} \end{array}\right.$

Affinities.—This species has the aspect of *Membranipora irregularis* Manzoni, 1875, of the Italian Pliocene, but differs in its larger dimensions ($Lz = 0.70$ and not 0.60 mm.) and in the absence of a distal thickening in the form of a turret. It has also the general aspect of the recent *Membranipora irregularis* Smitt, 1872; but we have noted (see p. 142 of Bulletin 106, U. S. National Museum) that the latter is a characteristic *Alderina*; there is therefore a fundamental difference in the ovicell.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (very rare). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare). Recent: Various localities in the Gulf of Mexico.

Cotypes.—Cat. Nos. 68441, 68442, U.S.N.M.

Genus OGIVALINA Canu and Bassler, 1917.

(For description see Bulletin 106, U. S. National Museum, p. 117.)

OGIVALINA MUTABILIS Canu and Bassler, 1919.

Plate 1, fig. 3.

1919. *Ogivalina mutabilis* Canu and Bassler. Geology and Paleontology of the West Indies, Bryozoa, Publication Carnegie Institution of Washington, No. 291, p. 80, pl. 1, fig. 4.

Description.—The zoarium is incrusting. The zooecia are elongated, oval, distinct, separated by a deep furrow; the mural rim is thin, smooth, rounded; there is often a small gymnocyst. The opesium is very large, irregular, more often oval. The ovicell is endozooecial, small, little convex. Sometimes there is a small interzooecial fusiform avicularium (?)

Measurements.—Opesia $\begin{cases} ho = 0.\ 60\text{–}0\ \ 70 \text{ mm.} \\ lo = 0.\ 30\text{–}045 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.\ 75\text{–}0.95 \text{ mm.} \\ lz = 0.\ 50\text{–}0.70 \text{ mm.} \end{cases}$

The great irregularity of form and zooecial dimensions of this species occasions its name. There are some variations which recall those of *Membranipora irregularis* Manzoni, 1875,[5] which possesses a mural rim enlarged at the base and also some large interzooecial avicularia.

The present species differs from the splendid *Ogivalina eximipora* Canu and Bassler, 1917, from the Middle Jacksonian in its smaller dimensions, in the absence of cryptocyst and in the presence of a gymnocyst. The avicularium (?) is identical in form and position.

Occurrence.——Upper Oligocene (Emperador limestone): Old quarry, one-third mile north of west of Empire, Panama Canal zone (rare). Upper Oligocene (Anguilla formation): Southwest side Crocus Bay Hill, Anguilla, Leward Islands (rare).

Holotype.—Cat. No. 68443, U.S.N.M.

OGIVALINA PARVULA Ulrich and Bassler, 1904.

Plate 12, fig. 6.

1904. *Membranipora parvula* Ulrich and Bassler. Bryozoa, Maryland Geological Survey, Miocene, p. 310, pl. 111, fig. 1, 2.

The original description of this species is as follows:

> In its general zoarial and zooecial characters this species resembles *Membranipora germana* Ulrich and Bassler, 1904 and *M. plebeia* Gabb and Horn. but it is readily distinguished by the smaller size and less elongate form of its zooecia. The walls are also relatively thicker while the longitudinal arrangement of the zooecia is more pronounced. Measuring longitudinally, 8 zooecia occur in 3 mm. and transversely 12 may be counted in the same space.

To the above we would add that there is a small gymnocyst and that the ovicell is endozooecial and the avicularium is interzooecial.

Occurrence—Miocene (Calvert formation): Reed's Maryland (rare.)

Holotype.—Cat. No. 68444, U.S.N.M.

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[5] Briozoi del pliocene antico di Castrocaro Bologna, 1875, p. 10, pl. 1, figs. 5, 8.

Genus HINCKSINA Norman, 1903.

(For description, see Bulletin 106, U. S. National Museum, p. 111.)

HINCKSINA QUADRISPINOSA, new species.

Plate 33, fig. 10.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a very deep furrow, large, elongated, elliptical; the mural rim is convex, thin, granulated, ornamented with four distal, hollow spines. The opesium has the same form as the zooecium. The ovicell is endozooecial, very small, scarcely salient.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.50\text{–}0.60 \text{ mm.} \\ lo = 0.24\text{–}0.26 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.64\text{–}0.70 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{array}\right.$

Affinities.—The total regeneration of the polypide is frequent and manifests itself, as is customary by a double mural rim. This species differs from *Membrendoecium grande* in the presence of four distal spines. It differs from *Membranipora echinata* D'Orbigny, 1839, in the presence of four (and not six) distal spines and in a much smaller ovicell. It differs from *Membranipora irregularis* D'Orbigny, 1839, of which it has the zooecial form, in its endozooecial and very small ovicell. Our specimen which showed the ovicell was not in a condition to be photographed.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (rare).

Holotype.—Cat. No. 68445. U. S. N. M.

HINCKSINA MULTISPINATA, new species.

Plate 33, fig. 11.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, elongated, oval or pyriform, provided with a small convex and smooth gymnocyst; the mural rim is thick, round, salient and bears 16 to 18 large, hollow spines; the opesium is anterior, oval, entire.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.24\text{–}0.26 \text{ mm.} \\ lo = 0.14\text{–}0.16 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.40 \text{ mm.} \\ lz = 0.28\text{–}0.34 \text{ mm.} \end{array}\right.$

Affinities.—The four distal spines are sometimes smaller and more crowded; the others are regularly distributed around the opesium. The figured specimen only having been found, we have not been able to verify whether the ovicell is really endozooecial; a single zooecium shown in our figure appears to have this character. We have observed a case of total regeneration of the polypide.

This species differs from *Membranipora variegata* Hincks, 1881, in having more than thirteen spines. It differs from *Membranipora echinus* Hincks, 1884, in the possession of more than two spines in the distal third of the zooecium. It differs from *Membranipora echinata* D'Orbigny, 1839, in having more than six spines. It differs from *Membranipora pyrula* Hincks, 1881, in its smaller dimensions and in the presence of a greater number of spines.

Occurrence.—Pleistocene: Santa Barbara, California (very rare).

Holotype.—Cat. No. 68446, U.S.N.M.

SECTION III. OVICELL HYPERSTOMIAL ALWAYS CLOSED BY THE OPERCULUM.

Genus MEMBRANIPORIDRA Canu and Bassler, 1917.

(For description, see Bulletin 106, U. S. National Museum, p. 133.)

MEMBRANIPORIDRA PARCA, new species.

Plate 12, fig. 7.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, regularly elliptical; the frontal is formed of a convex gymnocyst principally developed in the inferior part of the zooecium. The opesium is regularly elliptical and bears a distal indentation in which the operculum is placed. The ovicell is convex, smooth, transverse, placed on the gymnocyst of the distal zooecium; it is always closed by the operculum.

Measurements.—Opesia $\begin{cases} ho = 0.30 \text{ mm.} \\ lo = 0.22 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{cases}$

Variations.—It is very difficult to interpret the operation of the operculum on the fossils. Here the ovicell is indeed separated from the opesium by the mural rim, but the superior indentation of the opesium which corresponds to the operculum is of exactly the same form as the orifice of the ovicell. It is therefore very probable that our generic assignment is exact.

This species rests directly upon the shell and does not secrete a calcareous dorsal. This *ecqnomy* of calcite is rather rare in the strata which are not exclusively arenaceous.

Occurrence.—Miocene (Choctowhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (very rare).

Holotype.—Cat. No. 68447, U.S.N.M.

DIVISION IV. OVICELL NEVER CLOSED BY THE OPERCULUM.

Genus ALDERINA Norman, 1903.

(For description, see Bulletin 106, U. S. National Museum, p. 140.)

ALDERINA CESTICELLA, new species.

Plate 12, figs. 4, 5.

Description.—The zoarium incrusts oysters. The zooecia are distinct, elongated, oval, separated by a deep furrow, ornamented by a short gymnocyst; the mural rim is thin; enlarged behind in the form of a cryptocyst, rounded, salient, garnished with six to eight large distal spines; the opesium is anterior, oval, surrounded by a salient and finely wrinkled collar. The ovicell is large, salient, globular, hemispherical, bearing a large, inferior *collar*, transverse and linear. The ancestrula bears an opesial sinus.

Measurements.—Opesia $\begin{cases} ho = 0.20\text{–}0.25 \text{ mm.} \\ lo = 0.15\text{–}0.22 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.40\text{–}0.50 \text{ mm.} \\ lz = 0.25\text{–}0.30 \text{ mm.} \end{cases}$

Affinities.—This species is irregular in its micrometric measurements, but the zooecial form remains always pyriform. The ancestrula is quite remarkable. It is elliptical and deprived of spines. It engenders two large and three small zooecia. Its opesium bears a deep sinus, the significance of which is unknown. The marginal zooecia are larger and become almost triangular. Regenerated zooecia are quite frequent. Although the ovicell projects much on the opesium, we think, however, that it does not become closed by the operculum. Moreover, the zooecial form is that of *Alderina imbellis* Hincks, 1860.

This species differs from *Membranipora galeata* Busk, 1854, in the presence of six to eight distal spines (and not four) and in the absence of a triangular area on the ovicell.

Occurrence.—Miocene (Duplin marl): Natural well, 2 miles southwest of Magnolia, Duplin County, North Carolina (rare).

Holotype.—Cat. No. 68448, U.S.N.M.

Genus CALLOPORA Gray, 1848.

(For description see Bulletin 106, U. S. National Museum, p. 145.)

CALLOPORA DUMERILII Savigny-Audouin, 1826.

Plate 1, fig. 2; plate 2, fig. 23; plate 12, fig. 12.

1826. *Flustra dumerilii* Audouin, Explication Savigny's Egypte, Polypes, pl. 10, fig. 12.
1891. *Membranipora dumerilii* Waters, North Italian Bryozoa, Quarterly Journal Geological Society of London, vol. 47, p. 12, pl. 2, fig. 4.
1894. *Membranipora dumerilii* Levinsen, Mosdyr, Zoologica Danica, Hefte 9, p. 57, pl. 4, figs. 22–25.
1907. *Membranipora dumerilii* Calvet, Bryozoaires Expedition scientifique du *Travailleur* (1881–82) et du *Talisman* (1883), p. 385 (bibliography).
1909. *Callopora dumerilii* Norman, On the polyzoa of Madeira and neighboring islands, Linnean Society Journal, Zoology, vol. 30, p. 287.
1912. *Membranipora dumerilii* Canu, Etude des Bryozoaires Helvetiens de l'Egypt, Memoires de l'Institute Egyptien, vol. 6, p. 196, pl. 10, fig. 7 (see for complete bibliography).
1919. *Callopora dumerilii*, var. *lata* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa Publication Carnegie Institution of Washington, No. 291, p. 81, pl. 1, fig. 1.
1920. *Callopora dumerilii* Canu and Bassler, North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 148, pl. 3, fig. 15. (see for zoological and paleontological bibliography).

This species presents two different aspects. Very frequently the zooecium is almost elliptical and there are two symmetrical frontal avicularia (as figured by Waters, Levinsen, and Busk). More rarely the zooecium is oval and there is only a single small interopesial avicularium (as figured by Hincks and Jullien). One specimen from Anguilla has this second aspect which appears to be that of zooecia in the vicinity of the ancestrula (pl 1, fig. 2). In 1919 we separated this second form as a new variety, var. *lata*, but until more specimens are collected we now prefer to leave the synonymy as above.

We refer doubtfully to this species two specimens incrusting a shell from the lower Miocene of Florida which appear to agree with Busk's figure of 1850 (pl. 12, fig. 12).

American occurrence.—Oligocene (Anguilla formation): Southwest side of Crocus Bay bluffs, uppermost horizon, 125 feet above sea level, Anguilla, Leeward Islands (rare). Jacksonian (Castle Hayne limestone): Wilmington, North Carolina (rare). Miocene (Bowden marl); Bowden Jamaica (rare). Miocene (Chipola marl): Chipola River, Calhoun County, Florida (rare).

Habitat.—Dredged to a depth of 280 meters.

Plesiotypes.—Cat. Nos. 68449, 68450, U.S.N.M.

CALLOPORA PARVIROSTRIS, new species.

Plate 12, fig. 3.

Description.—The zoarium incrusts the shell of a *Pecten*. The zooecia are distinct, separated by a deep furrow, somewhat elongated, ovoid but with irregular contours; the mural rim is salient, thin, granular, somewhat enlarged at the base. The opesium is of the same form as the zooecium. The ovicell is small, very globular, smooth, opening below the operculum by a very small orifice. The interzooecial avicularium is triangular, suberect, very *small* with two large condyles for pivots.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.45 \text{ mm.} \\ lo = 0.30\text{–}0.35 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.55\text{–}0.60 \text{ mm.} \\ lz = 0.45\text{–}0.50 \text{ mm.} \end{array}\right.$

Affinities.—This species belongs to the *C. tenuirostris* group in the presence of its interzooecial avicularium. It differs from the genotype in its much larger micrometric dimensions and in its very small avicularium.

Occurrence.—Miocene (Calvert formation): 1 mile south of Parkers Creek, Calvert County, Maryland (very rare).

Holotype.—Cat. No. 68451, U.S.N.M.

CALLOPORA LANCEOLATA, new species.

Plate 12 fig. 11.

Description.—The zoarium incrusts oysters. The zooecia are distinct, elongated, fusiform, adjacent to each other by their mural rim; the mural rim is very thin, rounded; a little enlarged at the base; the opesium is elliptical, regular; traces of three pairs of spines are visible. The ovicell is large, salient, rectangular, garnished in front by a large convex area. The avicularium is placed at the base of each opesium; it is large, lanceolate; the beak is very salient and directed toward the base.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.35 \text{ mm.} \\ lo = 0.20\text{–}0.25 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.60\text{–}0.70 \text{ mm.} \\ lz = 0.35 \text{ mm.} \end{array}\right.$

Affinities.—Above the ovicell the avicularium is frequently divided into two smaller, symmetrical avicularia.

This species differs from *Amphiblestrum constrictum* Ulrich and Bassler, 1904, in its much larger avicularia, more elongated zooecia, and in the absence of two prominent condyles for the articulation of the operculum.

Occurrence.—Upper Miocene (Yorktown formation): 3 miles southwest of Petersburg (rare) and Beulahland, King and Queen County, Virginia (rare).

Holotype.—Cat. No. 68452, U.S.N.M.

CALLOPORA CRASSOSPINA, new species.

Plate 33, fig. 13.

Description.—The zoarium incrusts bryozoa. The zooecia are distinct, separated by a furrow, elongated, oval; the mural rim is thin, round, little salient and bears distally six large, hollow spines; the opesium is large, oval, entire. The avicularium is interzooecial, long, fusiform, with pointed and salient beak. The ovicell is globular, salient, smooth.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.30\text{–}0.32 \text{ mm.} \\ lo = 0.20\text{–}0.24 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.40 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{array}\right.$

Affinities.—Our ovicelled specimen was not in a condition for photography, but it is well preserved and our generic determination is exact. We have observed some calcified and perforated zooecia.

In the number of spines this species much resembles *Membranipora echinata* D'Orbigny, 1839. It differs from it in its oval opesia and in the presence of the interzooecial avicularium. It belongs to the group of *Callopora tenuirostris.*

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Holotype.—Cat. No. 68453, U.S.N.M.

CALLOPORA GUERNEI Jullien, 1903.

Plate 45, figs. 3, 4.

1903. *Membranipora guernei* JULLIEN, Bryozoaires provenant des Campagnes de *l'Hirondelle* (1886–1888), Resultats des Campagnes scientifiques du Prince de Monaco, fasc. 23, p. 40, pl. 5, fig. 3.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.33 \text{ mm.} \\ lo = 0.20\text{–}0.25 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.45\text{–}0.50 \text{ mm.} \\ lz = 0.30\text{–}0.38 \text{ mm.} \end{array}\right.$

Affinities.—The micrometric measurements noted on Jullien's figures are a little larger than ours; but as these are drawings and not photographs an error is always possible. Our specimens have the regularly oval zooecia shown in the figures of the French zoologist. Moreover, the interzooecial avicularia are identical with those described by Calvet in the same publication, "ils sont de forme ovoide a mandibule arrondie, et disposés soit obliquement, soit transversalement par rapport au grand axe de zoöécies."

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (very rare).

Habitat.—Gulf of Gascony at 135 meters.

Plesiotypes.—Cat. No. 68454, U.S.N.M.

CALLOPORA FILUM Jullien, 1903.

Plate 45, fig. 5.

1907. *Membranipora filum* CALVET, Bryozoaires, Expédition Scientifique du *Travailleur* et *du Talisman*, p. 386 (bibliography).

The ovicell of this species has not yet been described exactly, but Calvet writes that there are many ovicells which have the peculiarity of being operculated; that they are rather salient, have a semicircular basal contour and are provided with a semicircular orifice placed below the zooecial orifice. We believe that there is, therefore, no doubt in assigning the species to the genus *Callopora,* although the figure of Smitt, 1872, suggested an endozooecial ovicell. Our specimens are encrusting a coral.

Occurrence.—Pleistocene, Mount Hope, Panama Canal Zone (rare).

Habitat.—Northeast of Morocco (714 meters), Cape Verde Islands (110–180 meters), Azores (80–318 meters), Corse and Florida (21–97 meters).

Plesiotype.—Cat. No. 68455, U.S.N.M.

CALLOPORA HORRIDA Hincks, 1880.

Plate 33, figs. 18, 19.

1880. *Membranipora horrida* HINCKS, Contributions towards a general history of the marine Polyzoa, Annals and Magazine of Natural History, ser. 5, vol. 6, p. 82, pl. 10, fig. 6.

1908. *Membranipora horrida* ROBERTSON, The incrusting Cheilostomatous Bryozoa of the West Coast of North America, University of California Publications, Zoology, vol. 4, No. 5, p. 260, pl. 4, figs. 3, 4.

1898. ? *Membranipora californiensis* WATERS, Observations on Membraniporidae, Journal Linnean Society Zoology, vol. 26, p. 681, pl. 49, fig. 14.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.28\text{–}0.30\text{ mm.}\\ lo=0.16\text{–}0.18\text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{ mm.}\\ lz=0.30\text{–}0.40\text{ mm.}\end{array}\right.$

Our specimens have two areal spines, sometimes four. They present micrometric measurements a little different from those noted on Miss Robertson's figure; it is difficult, however, to admit two distinct species, the other characters being very similar. In studying a recent specimen of this species we have been convinced that the orifice of the ovicell is very small and can not be closed by the operculum.

Membranipora californiensis Waters, 1898, presents six articulated areal spines; our form is therefore intermediate between Waters' species and that of Hincks.

This species differs from *Membranipora occultata* Robertson, 1908, in shorter opesium, and in its larger and differently placed avicularium.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Habitat.—Eastern Pacific: Pacific Grove (Robertson) and the Queen Charlotte Islands (Hincks).

Plesiotype.—Cat. No. 68456, U.S.N.M.

CALLOPORA CIRCUMCLATHRATA Hincks, 1881.

Plate 34, figs. 1–3.

1881. *Membranipora circumclathrata* HINCKS, Contribution general history of Marine Polyzoa 7, Foreign Membranipora, Annals and Magazine Natural History, ser. 5, vol. 8, p. 131 (sep. 72), pl. 5, fig. 1.

1908. *Membranipora circumclathrata* ROBERTSON, The incrusting Cheilostomatous Bryozoa of the West Coast of North America, University of California Publications, Zoology, vol. 4, p. 259, pl. 14, figs. 1, 2.

Structure.—In this species the ovicell is not closed by the operculum. Not only is this quite visible on the fossils but we have been able to verify it on a recent specimen dredged off Santa Monica. Sometimes a triangular pore is visible in the separating furrow of two zooecia; it is clearly attached to one of the mural rims and it is perhaps the base of a pedunculate avicularium as is the genus *Cauloramphus*. We have not observed these pores on our recent specimens. At the base of each opesium there is a small triangular avicularium with salient beak placed on the median zooecial axis. It sometimes becomes very large and is developed obliquely as in *Callopora horrida* Hincks, 1880. Nevertheless, the presence of wide-spaced areolar pores differentiates the two species clearly.

Occurrence.—Pleistocene: Santa Monica (Long Wharf Canyon), California (rare).

Habitat.—Pacific coast of California.

Plesiotypes.—Cat. No. 68457, U.S.N.M.

CALLOPORA (?) SPECIOSA Gabb and Horn, 1862.

Plate 9, fig. 13.

1862. *Membranipora speciosa* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences, Philadelphia, ser. 2, vol. 5, p. 159, pl. 20, fig. 45.

The original description is as follows:

Colony encrusting in irregular patches, composed of elongated, oval cells, often crowded out of their normal shape. Cells arranged in longitudinal lines and in somewhat irregular quincunx, often assuming a transverse arrangement; aperture occupying the whole of the surface, cell walls plain, angular, at their edge or slightly rounded. Interior of the cell, regularly concave, with the sides of the concavity reaching almost to the top of the walls; in new cellules the germinal plate only is seen. This germinal plate often extends for a considerable distance beyond the colony (half an inch) and is marked by irregular longitudinal lines, frequently bent suddenly in an oblique direction and then continued longitudinally as before. Between the cellules are frequently open angular spaces, caused by the inaccurate apposition to the cellules.

Occurrence.—Miocene: Chiriqui, Central America.

CALLOPORA (?) MULTIPORA Gabb and Horn, 1862.

Plate 33, fig. 12.

1862. *Siphonella* (*Flustrellaria*) *multipora* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences, Philadelphia, ser 2, vol. 5, p. 154, pl. 21, fig. 38.

The original description follows:

Colony free (arranged in a tube in the only specimen we have seen), cellules outside, back, or inside of the tube showing the outline of the cellules. Cellules oval, juxtaposed, placed in irregular quincunx. Opening larger, occupying nearly the whole surface of the cellule; usually of the same shape as the cellule, sometimes having the proximal end wider than the distal end. Cell walls convex or flattened; marked by a variable number of pits often surrounded each by a distinct elevation or wall. The mouth is sometimes constricted by a small rim, parallel with the ordinary wall, placed inside of, and below it. This rim is ornamented in the same manner as the larger one.

Occurrence.—Pleistocene: Santa Barbara, California.

Genus AMPHIBLESTRUM Gray, 1848.

(For description see Bulletin 106, U. S. National Museum, p. 156.)

AMPHIBLESTRUM CONSTRICTUM Ulrich and Bassler, 1904.

Plate 13, figs. 1–6.

1904. *Amphiblestrum constrictum* Ulrich and Bassler, Bryozoa, Maryland Geological Survey, Miocene, p. 413, pl. 115, figs. 6, 7; pl. 118, fig. 15.

The original description is as follows:

Zoarium forming crusts of small extent upon shells, the types growing on a *Pecten*. Zooecia arranged in rather irregular rows, 6 to 8 in 3 mm. Aperture subovate, more or less constricted in front of the midlength, enclosed a sloping and finely striated border, widest posteriorly. Frontal lamina very little developed forming the sloping and transversely striated border just mentioned. Ovicells abundant, large, moderately convex, the middle portion distinguished by being minutely pitted or porous. Avicularia of moderate size, usually one, rarely two to each zooecium, of the same type as in *A. flemingi* but with the apex more prominent.

This species is closely related to *A. flemingi* Busk, 1854, and *A. trifolium* Wood, both living in the seas of to-day and known also as fossils from late Tertiary beds of England and Italy. It is distinguished from both by the lesser development of the frontal lamina. The constriction of the aperture is usually more pronounced in *A. constricta*.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.30 \text{ mm.} \\ lo = 0.22 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.52\text{–}0.54 \text{ mm.} \\ lz = 0.36 \text{ mm.} \end{array}\right.$

Variations.—The cryptocyst is very little developed: it is more like a proximal enlargement of the mural rim. By abrasion of the surface, the five dietellae are easily visible. The beak of the avicularium is salient and rounded. The two salient condyles arranged symmetrically in the opesium are intended to support the articulation of the operculum. The ancestrula is orbicular, without spines. It engenders one large and three small zooecia; the two groups are separated by two large zooecia derived from the small ones. We have observed some calcified zooecia perforated by a small median pore. Regenerated zooecia are rare.

Affinities.—In a recent letter, Mr. Waters remarks that the differences between this species and *Amphiblestrum flemingi* Busk, 1854, are not sufficient to separate the two species. It is evident that we have here a difficult problem in specific determination and that we are not yet able to distinguish the true characters of the species from those of a variety. The problem is further complicated by the great zooecial variations.

The micrometric measurements taken on the recent specimens and on those from the Helvetian of Touraine and the Tortonian of Eisenstadt, Hungary, are always smaller than those of *A. constrictum*, a character which may be sufficient to maintain the American species. The American specimens also appear deprived of oral spines. However, the specific name is a small matter if the illustrations are good for careful comparisons.

Occurrence.—Miocene (St. Mary's formation): Cove Point, Maryland (rare). Miocene (Yorktown formation): 3 miles southwest of Petersburg, Virginia (rare). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare).

Plesiotypes.—Cat. Nos. 68456, 68459, U.S.N.M.

AMPHIBLESTRUM TENUIPARIETIS, new species.

Plate 13, fig. 7.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, hexagonal, rounded above; the mural rim is very thin, rounded, very finely granulated; the cryptocyst is of little depth, concave, granular; the opesium is oval, narrowed laterally by two condyles serving for articulation of the opercular valve; it bears a concave or undulated proximal border. The avicularium is elliptical, salient, with pointed beak directed below.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.30 \text{ mm.} \\ lo = 0.40 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.55 \text{ mm.} \\ lz = 0.45 \text{ mm.} \end{array}\right.$

Affinities.—The ancestrula is orbicular, garnished with very small spines, it engenders three small and two large zooecia.

This species is quite close to *Amphiblestrum flemingi* Busk, 1854; it differs from it in the absence of gymnocyst, and in the larger ancestrular zooecia. It appears to be the equatorial equivalent. *Amphiblestrum flemingi* is a species from the cold and temperate regions; it occurs from the polar circle to the forty-fourth parallel in depths where the temperature is from 3.1° to 6.7° C. Our American species represent, therefore, the simplification which the warmth of the waters may provoke in a species.

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare).

Holotype.—Cat. No. 68460, U.S.N.M.

Genus RAMPHONOTUS Norman, 1894.

(For description, see Bulletin 106, U. S. National Museum, p. 163.)

RAMPHONOTUS ASPERUS, new species.

Plate 13, figs. 11–13.

Description.—The zoarium incrusts shells and masses of *Stylopoma spongites*. The zooecia are elongated, distinct, oval, much enlarged at the base; the mural rim is thin, much enlarged in the lower part of the cryptocyst, and bears two large areal spines and generally four smaller ones; the opesium is anterior, oval, trifoliated, narrowed laterally by two little salient condyles on which articulates probably the opercular valve. The ovicell is hyperstomial, salient, globular, ornamented by a small transverse area. The avicularium is large, salient, transverse, triangular, with beak pointed and thin and placed regularly below each opesium.

Elongate zooecia:

Measurements.—Opesia$\left\{\begin{array}{l} ho=0.24\text{ mm.}\\ lo=0.20\text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.50\text{ mm.}\\ lz=0.40\text{ mm.}\end{array}\right.$

Transverse (short) zooecia:

Opesia$\left\{\begin{array}{l} ho=0.18\text{–}0.20\text{ mm.}\\ lo=0.20\text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.44\text{ mm.}\\ lz=0.40\text{ mm.}\end{array}\right.$

Variations.—The zooecia are often short and wide. The number of spines is variable and may be eight, but there are always two large hollow spines on the ovicelled zooecia. The calcified and perforated zooecia and regenerated zooecia are not rare. All of the avicularia are not large and transverse; they are sometimes much reduced and orbicular, especially in the vicinity of the ancestrula. The walls are fragile and fossilization gives the species quite variable and curious aspects (fig. 12). The dietellae are arranged as in *Callopora* (fig. 13).

The presence of species of this genus seems to indicate that in the localities where they lived the waters were calm and little rich in diatoms.

Affinities.—This species differs from *Ramphonotus agellus* Ulrich and Bassler, 1904, in its triangular avicularium placed transversely. It differs from *Ramphonotus rhynchota* Busk in its very different dimensions and in the presence of more than two spines.

Occurrence.—Miocene (Yorktown formation): 3 miles southwest of Petersburg, Yorktown, Beulahland, King and Queen County, 1 mile northeast of Suffolk, and other localities in Virginia (rare).

Cotypes.—Cat. No. 68461, U.S.N.M.

RAMPHONOTUS MULTISPINATUS, new species.

Plate 34, fig. 4.

Description.—The zoarium incrusts shells. The zooecia are oval or elliptical, elongated, distinct; separated by a deep furrow; the mural rim is wide, salient, round, and bears four small distal spines, two large hollow spines at the level of the condyles, and a variable number of areal spines; the opesium is anterior, oval, trifoliated. On the gymnocyst there is a large avicularium.

Measurements.—Opesia $\begin{cases} ho = 0.24 \text{ mm.} \\ lo = 0.16\text{–}0.18 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.40\text{–}0.50 \text{ mm.} \\ lz = 0.28\text{–}0.40 \text{ mm.} \end{cases}$

Affinities.—The two large spines are fixed at the level of the condyles which narrow the opesium and which serve for the articulation of the opercular valve.

This species differs from *Ramphonotus asperus* in its spines, which are more numerous and of two kinds.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Holotype.—Cat. No. 68462, U.S.N.M.

RAMPHONOTUS AGELLUS Ulrich and Bassler, 1904.

Plate 13, figs. 8–10.

1904. *Amphiblestrum agellus* ULRICH and BASSLER, Bryozoa, Maryland, Geological Survey, Miocene, p. 414, pl. 112, figs. 7*a*, 7*b*; pl. 118, fig. 14.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, ovoid, much enlarged at their base; the mural rim is thin and sharp; the cryptocyst is short, oblique, concave. The opesium is transverse, trifoliate, much narrowed at the level of two large spines and of the hinge of the opercular valve. The ovicell is quite salient, globular, smooth, formed of two calcareous lamellae the superior one of which is incomplete and limits a small semilunar frontal area. The gymnocyst bears a large very salient oblique avicularium with its beak turned toward the base.

Measurements.—Opesia $\begin{cases} ho = 0.20 \text{ mm.} \\ lo = 0.22\text{–}0.24 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.46 \text{ mm.} \\ lz = 0.30\text{–}0.46 \text{ mm.} \end{cases}$

Variations.—The original type of the species is incomplete and formed of ancestrular zooecia, which in this genus are always much smaller than the normal zooecia. Other specimens found at the same horizon in Virginia appear to represent the true form of the species. The avicularium is triangular and very salient. On account of its oblique arrangement it is very fragile and is not well preserved in fossilization. The opesium is elongated in the ancestrular zooecia but transverse in the other.

Affinities.—This species differs from *Ramphonotus minax* Busk, 1864, in its trifoliate opesium and in its avicularium oriented in the zooecial axes. It differs from *R. asperus* in the presence of two large spines instead of six and in its avicularium not arranged transversely. The worn or broken forms of this species are very difficult to distinguish.

Occurrence.—Miocene (St. Mary's formation): Cove Point, Maryland (rare); Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia (rare).

Plesiotype—Cat. No. 68463, U.S.N.M.

Genus CAULORAMPHUS Norman, 1903.

(For description, see Bulletin 106, U. S. National Museum, p. 174.)

CAULORAMPHUS POROSUS, new species.

Plate 33, fig. 17.

Description.—The zoarium incrusts shells and bryozoa. The zooecia are large, distinct, separated by a deep furrow, irregularly elliptical; the mural rim is thin flat, finely striated, very little enlarged at the base; the opesium is large of the same form as the zooecium. Between the mural rims in the separating furrow there are numerous pores (8 to 10) which are bases of pedunculate and articulate avicularia.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.40\text{–}0.44 \text{ mm.} \\ lo = 0.28\text{–}0.32 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.60 \text{ mm.} \\ lz = 0.44\text{–}0.50 \text{ mm.} \end{array}\right.$

Affinities.—It should be remarked that the pores are not arranged on the mural rim where the termen is sharp. There are therefore no hollow spines; but they form the base, the place of attachment of pedunculate avicularia which surmount them. It is therefore in the genus *Cauloramphus* that this remarkable species must be classified.

The avicularia being organs of oxygenation we suppose that this species must live in absolutely calm waters little rich in diatoms. The incessant agitation of the mandibles appears to be intended to renew the impure water and to thus carry oxygen and nourishment.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Holotype.—Cat. No. 68464, U.S.N.M.

CAULORAMPHUS TRIANGULARIS, new species.

Plate 33, figs. 14–16.

Description.—The zoarium incrusts shells and bryozoa. The zooecia are distinct, separated by a wide and deep furrow, elongate, elliptical, with a very short proximal gymnocyst; the mural rim is wide, rounded, salient and bears two small distal and eight large areal hollow spines placed in the distal half of the zooecium; the opesium is elliptical or oval according to the form of the zooecium. The ovicell is hyperstomial, globular, ornamented by a semicircular area. In the separating furrow with each zooecium there is a small triangular pore which is the base of the articulation of a pedunculate and articulate avicularium.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.30\text{–}0.34 \text{ mm.} \\ lo = 0.18\text{–}0.22 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.48\text{–}0.52 \text{ mm.} \\ lz = 0.32\text{–}0.40 \text{ mm.} \end{array}\right.$

Affinities.—The presence of the small exterior avicularium at the line of the spines seems to indicate *Membranipora* (*Cauloramphus*) *corniculifera* Hincks, 1882, from the Queen Charlotte Islands. It differs from it in a smaller number of spines (less than 18) and in the very different arrangement of distal and areal spines. It differs from *Cauloramphus spiniferum* Johnston in the larger micrometric measurements ($Lz > 0.43$ mm.), in the presence of less than 12 spines and in the triangular form of the pore of the pedunculate avicularium. The two species are evidently very close.

The ancestrular zooecia are smaller than the others. The ancestrula is oval. garnished by 12 spines; it engenders three large and three small zooecia.

This is the sixth species with large spines found at Santa Barbara, California. We are ignorant of the true function of these spines, but there is reason to believe that their ensemble forms a trap for diatoms the usual food of bryozoa. The very calm waters off California, therefore, obliged these animals to multiply their means of capture.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Cotypes.—Cat. No. 68465, U.S.N.M.

Family AETEIDAE Smitt, 1867.

Genus AETEA Lamouroux, 1812.

(See Bulletin 106, U. S. National Museum, p. 179, for discussion.)

AETEA ANGUINA? Linnaeus, 1758.

Plate 24, fig. 15.

To this recent species we have referred doubtfully the creeping network of a bryozoan from the Pliocene of South Carolina. Without a more complete zoarium it is impossible to make a more definite identification, but we figure the specimen in order to call attention to fossil bryozoa of this type of structure. The geological distribution and other features of this species have been given in our Monograph on North American Early Tertiary Bryozoa.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

Plesiotype.—Cat. No. 68466, U.S.N.M.

Family CHAPERIIDAE Jullien, 1888.

1888. *Chaperiidae* JULLIEN, Mission scientifique du Cap Horn, VI, Zoologie, Bryozoaires, p. 61.

The orifice is semilunar, or subcircular, very large, entirely closed by the operculum, provided interiorly with one or more calcareous plates serving for the insertion of the retractor muscular fibers of the operculum; the frontal is deprived of pores. The ancestrula, of the same form as the zooecia, is oval and bears some articulated spines on the border. (Translated after Jullien.)

Genus CHAPERIA Jullien, 1881 (first group).

1881. *Chaperia* JULLIEN, Remarques sur quelques Espèces de Bryozoaires Cheilostomiens, Bulletin Société zoologique de France, vol. 6, p. 61.

Two internal calcareous plates, with extremities fixed and serving for the insertion of the retractor muscular fibers of the operculum. (Translated, after Jullien.)

Type.—*Chaperia* (*Flustra*) *acanthina* Quoy and Gaymard, 1824. Range: Miocene—Recent.

The species of this genus corresponding exactly to Jullien's definition are: *Chaperia* (*Flustra*) *acanthina* Quoy and Gaymard, 1824; *C.* (*Amphiblestrum*) *spinosa* MacGillivray, 1881; and *C. spinosissima* Calvet, 1904.

The ovicell of these forms has never been figured. Jullien alone affirmed (but he has given no figure) that the operculum does not close the ovicell. Waters and Calvet classify in the same genus a certain number of other forms with concave

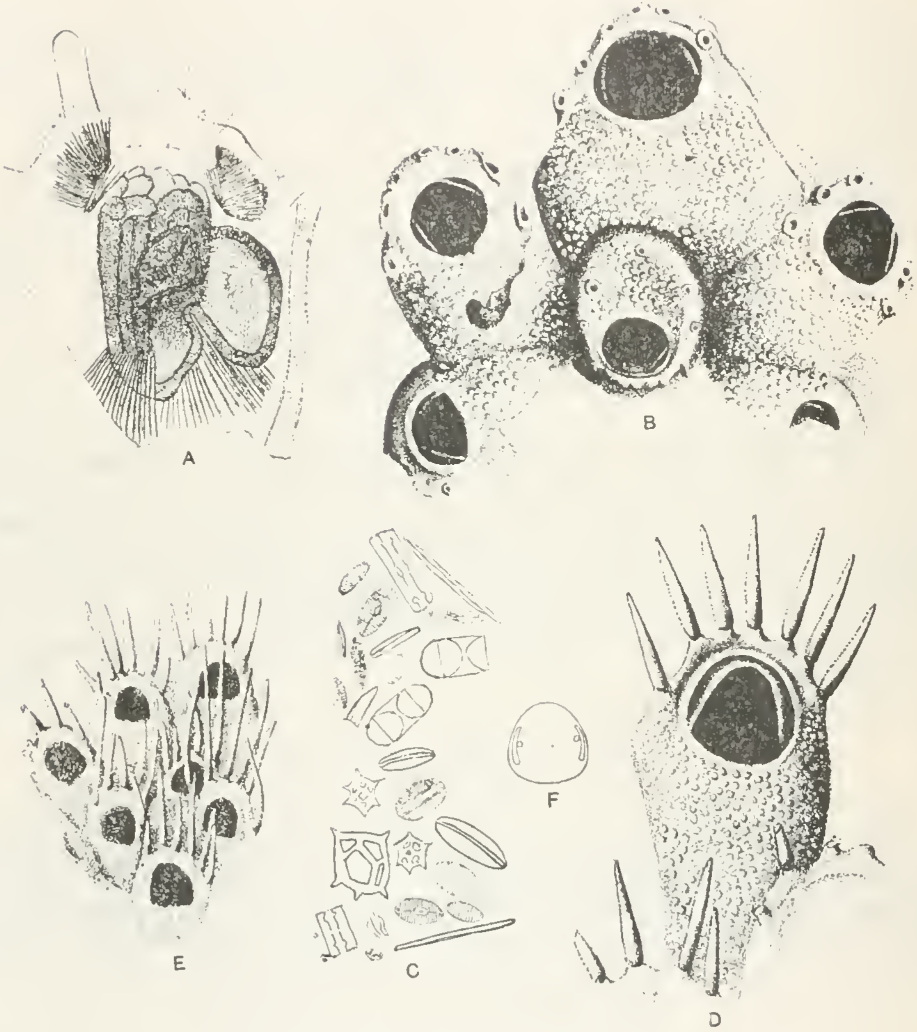


Fig. 3.—Genus *Chaperia* Jullien, 1881.

Figs. A–G. *Chaperia acanthina* Quoy and Gaymard, 1824.

A. Interior of a zooecium showing the polypide and the retractor muscles of the operculum. These are the two enormous muscular bundles which characterize the family Chaperiidae, determining in the zooecia the formation of the calcareous lateral plates situated below the orifice. Such plates are the most characteristic remains of this anatomical arrangement which existed as far back as the Cretaceous period.

B. A young colony, × 70, treated with "eau de javelle," showing the ancestrula with the base of the spine of the circumference. In this ancestrula the two lateral funnels which serve for the insertion of the retractor muscles of the operculum, can be seen.

C. Diatoms and radiolaria found in the digestive apparatus of this species, × 216. The radiolarian is *Dyctioca speculum* Ehrenberg, a species encountered in many other bryozoa.

D. Very young zooecium bearing spines and in the orifice of which the funnels in process of formation, still unseparated, can be seen.

E. Zooecia covered over by the ectocyst and bearing marginal spines. (Figs. A–E, after Jullien, 1888.)

F. Operculum (after Kirkpatrick, 1890).

frontal and characterized by the same calcareous lamellae. With our present poor state of knowledge of the larva we can not be absolutely certain that this single anatomical peculiarity is sufficient to characterize a family. We think, therefore, that it is preferable to group in a distinct section these species with concave frontal under the same name but placed under the authority of Waters.

The Cretaceous forms figured by D'Orbigny and Hagenow have already been separated under tha name of *Hagenowinella* Canu, 1900.

Jullien, who has studied and figured *Membranipora galeata* Busk, 1852, has not classified it in his genus.

Genus CHAPERIA (Waters, 1898) Levinsen, 1909 (second group).

1909. *Chaperia* Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa p. 115.

The original description of this genus by Levinsen follows:

> The distal part of the zooecium is furnished internally with two lateral spaces open towards the frontal surface (sometimes coalesced to a single horseshoe shaped one), formed by two plates which project from the side walls and converge towards the distal wall. Each distal wall has two multiporous rosette plates [septular plates] and the distal half of each side wall a single one. Hyperstomial free ooecia with a completely calcified ectooecium [and a special operculum]. The zooecia, which may sometimes have a membraneous opercular valve, sometimes a chitinous compound operculum, are generally strongly provided with spines and have often a well-developed [concave] cryptocyst. Avicularia sometimes trumpet shaped, not always present. The colonies are generally incrusting.

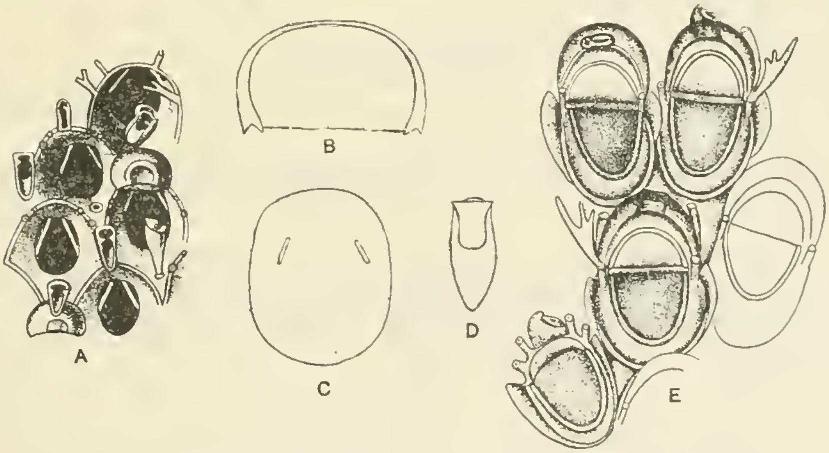


Fig. 4.—Genus *Chaperia* (Waters, 1898) Levinsen, 1909.

Figs. A–D. *Chaperia bilamellata* Waters, 1898. A. Specimen, ×25, from Port Elizabeth, South Africa, showing the principal variations of the avicularia, etc. B. Operculum of the orifice of the ovicell, ×85. C. Operculum of the aperture, ×85. D. Mandible of the avicularium, ×85. (Figs. A–D, after Waters, 1898.)

Fig. E. *Chaperia cervicornis* Busk, 1852. Zooecia showing the operculum of the aperture and that of the ovicell in position (after Hincks, 1881).

Type.—Chaperia bilamellata Waters, 1898.

To this genus belong the following species:

Chaperia (*Amphiblestrum*) *cristata* Busk, 1884.

Chaperia (*Membranipora*) *annulus* Manzoni, 1875 (*Chaperia galeata* Busk, 1852)
Chaperia (*Membranipora*) *cervicornis* Busk, 1852.
Chaperia (*Electra*) *cylindracea* Busk, 1884.
Chaperia (*Membranipora*) *albispina* MacGillivray, 1882.
Chaperia (*Amphiblestrum*) *capensis* Busk, 1884.
Chaperia palulosa Waters, 1904.
Chaperia tropica Waters, 1909.
Chaperia galeata Busk, 1852.
Chaperia bilamellata Waters, 1898.

In this list given by Levinsen there is not a single species recognized as identical with the genotype of Jullien. The best known species of this group is *Chaperia galeata* Busk, 1852. The best figures have been drawn from the fossils. The only good figures of the recent specimens have been given by Jullien, 1888, which have not the characteristic lamellae. On the contrary. *Chaperia bilamellata* Waters, 1898, has been perfectly drawn with its chitinous appendages. Levinson classified this genus in the Bicellariidae.

CHAPERIA GALEATA Busk, 1852.

Plate 34, figs. 8–10.

1852. *Membranipora galeata* Busk, Catalogue of Marine Polyzoa in British Museum, Cheilostomata, pt. 2, p. 62, pl. 65, fig. 5.
1870. *Membranipora annulus* Manzoni, Briozoi fossili Italiani, Quarta contribuzione, Sitzungsberichte der kaiserlichen Akademie der Wissenschaften, Wien, vol. 61, Abth. 1, p. 7, pl. 1, fig. 6.
1875. *Membranipora annulus* Manzoni. I Briozoi del pliocene antico di Castrocaro, p. 12, pl. 1, fig. 9.
1877. *Membranipora annulus* Manzoni, Bryozoaires du pliocéne supérieur, de l'ile de Rhodes, Memoirs de la Société Géologique de France, ser. 3, vol. 1, Mem. No. 2, p. 62.
1879. *Membranipora galeata* Busk, Polyzoa from Kerguelen Island, Philosophical Transactions Royal Society London, vol. 168, p. 195.
1879. *Membranipora annulus* Seguenza, Le formazioni terziarie nella Provincia di Reggio (Calabria), Reale Accademia dei Lincei, Memorie della Classe di Scienze Fisiche, Matematiche e Naturali, ser. 3, vol. 6, pp. 80, 198, 294, 328.
1882. *Membranipora dentata* Waters, Fossil Bryozoa from Mount Gambier, South Australia, Quarterly Journal Geological Society London, vol. 38, p. 263, pl. 8, fig. 14.
1884. *Membranipora galeata* Busk, Report on the Polyzoa collected by H. M. S. *Challenger* (1873–1876), Pt. I, vol. 10, pt. 30, p. 64.
1884. *Amphiblestrum cristatum* Busk, Report on the Polyzoa collected by H. M. S. *Challenger* (1873–1876), Pt. I, vol. 10, pt. 30, p. 63, pl. 15, fig. 1.
1887. *Membranipora annulus* Waters, Tertiary Chilostomatous Bryozoa from New Zealand, Quarterly Journal Geological Society, vol. 43, p. 47, pl. 6, figs. 2, 5, 9.
1887. *Membranipora annulus* Pergens, Pliocäne Bryozoen von Rhodes, Annalen des k. k. naturhistorischen Hofmuseums, vol. 2, p. 17.
1888. *Membranipora galeata* Jullien, Mission scientifique du Cap Horn, VI, Zoologie, Bryozoaires, p. 75, pl. 5, figs. 6, 8.
1891. *Membranipora annulus* Neviani, Briozoi postpliocenici del sotto suolo di Livorno, Bollettino della Societa Geologica Italiana, vol. 10, p. 116.
1895. *Amphiblestrum annulus* MacGillivray, Monograph of Tertiary Polyzoa of Victoria, Transactions Royal Society Victoria, vol. 4, p. 43, pl. 6, fig. 3.
1895. *Membranipora galeata* Neviani, Briozoi fossili della Farnesina e Monte Mario presso Roma, Palaeontographica Italica, vol. 1, p. 96 (sep. 20), no. 10.

1895. *Membranipora galeata* NEVIANI, Briozoi neozoici di alcune localita d'Italia, Bollettino della Società Romana per gli Studi Zoologici, vol. 4, pt. 2, p. 233 (sep. 9), 1896; vol. 5, pt. 3, p. 121 (sep. 20).
1896. *Membranipora galeata* NEVIANI, Briozoi Postpliocenici di Spilinga (Calabria), Atti Accademia Gioenia di Scienze Naturali in Catania, ser. 4, vol. 9, p. 14.
1898. *Membranipora galeata* NEVIANI, Briozoi neozoici di alcune localita d'Italia, Bollettino de la Societa Romana per gli Studi Zoologici, vol. 7, pt. 4, p. 4; pt. 5, pp. 4, 6, 13 (sep.); 1900, pt. 6, p. 66 (sep. 9).
1898. *Chaperia annulus* WATERS, Observations on Membraniporidae, Journal Linnean Society Zoology, vol. 26, p. 673.
1898. *Chaperia annulus*, variety *bilaminata* WATERS, Observations on Membraniporidae, Journal Linnean Society, Zoology, vol. 26, p. 673, pl. 47, figs. 5. 8, 9.
1901. *Membranipora galeata* NEVIANI, Bryozoi neogenici delle Calabrie, Paleontographia italica, vol. 6, p. 152.
1904. *Membranipora galeata* CALVET, Bryozoen, Ergebnisse der Hamberger Magalhaensiche Sammelreise, 1892, 1893, vol. 3, p. 10.
1908. *Chaperia galeata* CANU, Iconographie des Bryozoaires fossiles de l'Argentine, Pt. I, Anales del Museo Nacional de Buenos Aires, vol. 17, p. 262, pl. 3, figs. 13, 14.
1909. *Chaperia galeata* CALVET, Bryozoaires, Expédition Antarctique Francaise, Sciences Naturelles, p. 17.

Historical.—Waters cleared up the principal characters of this species; he made known its structure and showed its identity with the fossil *Membranipora annulus* Manzoni of the Miocene. The complete bibliography which we give above, resulted from his work.

> The name *galeata* is the oldest, but from the description and figure in the British Museum Catalogue identification has not been made, and I should not have recognized it as a synonym without an examination of the Museum specimen. (Waters, 1908.)

However, in 1888 Jullien believed he had rediscovered Busk's species: he gave an excellent figure, but he did not classify it in his genus *Chaperia*. Jullien appeared to be mistaken, since Waters did not cite his work at all in the synonymy. On the other hand, Calvet, 1904, who had studied numerous specimens, rectified the omission of Waters. The fossil specimens of the Canu collection have never the aspect shown in Jullien's figures.

Affinities.—The number of spines varies from four to six. The zooecia in a circle are the ancestrular zooecia. It is remarkable that the genus *Chaperia* widespread in both hemispheres since the Miocene has emigrated into the Southern Hemisphere.

We do not believe that the entire synonymy adopted above is exact; there are certainly many species confounded under this name. Even in Italy under the name of *Chaperia annulus* the authors appear to have confused at least two species. Notably our specimens from Farnesina are absolutely distinct from those (and they are quite numerous) which we have collected in the Pleistocene of Palermo. But all these species are so variable that it is very difficult to find constant characters.

Occurrence.—Pleistocene: Santa Barbara, California (very rare). Santa Monica (Rustic Canyon), California (very rare).

Geological distribution.—Helvetian of Italy (Seguenza); Zanclean of Italy (Seguenza); Entrerrian of Patagonia (Canu); Miocene of Australia (Waters); Pliocene of New Zealand (Waters); Plaisancian of Italy (Manzoni, Neviani);

Astian of Italy (Seguenza, Neviani); Sicilian of Italy (Seguenza, Neviani); Post Pliocene of Italy (Neviani).

Habitat.—Kerguelen Islands (42 meters); Malouines Islands (6 to 16 meters); Bare Orange, Smiths Strait (12 to 27 meters); Straits of Magellan (16 meters); Southern Tierra delle Fuego (11 meters); Port Charcot (40 meters); Booth Wandel Island (30 meters); station 320 of the *Challenger*, near Montevideo (960 meters). The varieties *bilaminata* and *multifida* have been found in the Indian Ocean and at the Cape of Good Hope, the latter at a depth of 720 meters.

Plesiotype.—Cat. No. 68467, U.S.N.M.

CHAPERIA CAMINOSA Ulrich and Bassler, 1904.

Plate 14, figs. 2–4.

1904. *Membranipora caminosa* Ulrich and Bassler, Bryozoa, Maryland Geological Survey, Miocene, p. 409, pl. 111, figs. 3, 4.

Ulrich and Bassler's original description follows:

> Zoarium adnate, forming a thin, single sheet of indefinite extent. Zooecia arranged quincuncially, 6½ measuring longitudinally and 7½ to 8½ diagonally, in 3 mm. Opesia subcircular, separated by one-half to two-thirds their diameter; when the ooecium is wanting, a rim-like border encloses the anterio-half of the opening. Ooecia very high, with a rib across the top, and just in front of the latter a prominent chimney-like tube or hollow spine projecting obliquely over the zooecium next above. When the ooecium is broken away a semiovate or quadrangular concave space is uncovered between the ends of following zooecia. The hollow tubule behind the zooecial aperture is always present, but it is usually worn down so as to appear as merely a thick-rimmed pore. Where the zooecial arrangement is irregular or changed, a second or even a third tubule, each directed forward, may occur between the three zooecia.

This species is a perfectly characterized *Chaperia*. We reproduce figures of the types corrected with more care. Above each zooecium there is a very constant, small, erect, triangular avicularium with its beak above. A large pedunculate avicularium appears in a corner of the cryptocyst; it is almost always broken and appears only as a very irregular pore. There are four large distal articulated spines. We have from the Pleistocene of Palermo (Sicily) a variety of *Chaperia annulus* Manzoni, 1875, very close and which presents also a very constant, small, distal, triangular avicularium. The present species differs from it in the presence of the large, pedunculate avicularium, and its ovicell not smooth and formed of two thick, separable calcareous layers and in the triangular avicularium placed on the ovicell.

Occurrence.—Miocene (Choptank formation): Jones Wharf, Maryland (rare).

Cotypes.—Cat. No. 68469, U.S.N.M.

CHAPERIA PARVISPINA, new species.

Plate 14, fig. 1.

The figured specimen is the only one which has been found. It incrusts an oyster shell and is too incomplete to permit an exact description. However, the complete absence of large distal articulated spines is a specific character which amply justifies the establishment of a new species. They are replaced by a variable number of minute and very fragile spines.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.30 \text{ mm.} \\ lo = 0.26 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.40\text{–}0.50 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{array}\right.$

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (very rare).

Holotype.—Cat. No. 68470, U.S.N.M.

Family FARCIMINARIIDAE Busk, 1852.

Genus NELLIA Busk, 1852.

(For description, see Bulletin 106, U. S. National Museum, p. 195.)

NELLIA OCULATA Busk, 1852.

Plate 2, figs. 5–7.

1816. *Farcimia tenella* Lamarck, Histoire naturelle des animaux sans vertèbres, vol. 2, pl. 2, figs. 26, 27.
1816. *Cellaria tenella* Lamarck, Histoire naturelle des animaux sans vertèbres, ed. 1, p. 135.
1834. *Cellaria tenella* Blainville, Manuel d'Actinologie ou de Zoophytologie, p. 455.
1850–1852. *Cellaria tenella* D'Orbigny, Paleontologie Francaise: Terrain Crétace, vol. 5, p. 28.
1852. *Nellia oculata* Busk, Catalogue Marine Polyzoa, British Museum, Pt. I, Cheilostomata, p. 18, pl. 64, fig. 6; pl. 65, fig. 4.
1873. *Nellia oculata* Smitt, Floridau Bryozoa, Pt. II: Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 10, no. 11, p. 3, pl. 1, figs. 53, 54.
1880. *Nellia oculata* MacGillivray in McCoy's Prodomus of the Zoology of Victoria, vol. 1, decade 5, p. 51, pl. 49, fig. 5.
1881. *Nellia oculata* Haswell, On some Polyzoa from the Queensland coast, Proceedings Linnean Society New South Wales, vol. 5, p. 36.
1884. *Nellia oculata* Busk, Report on Polyzoa collected by the *Challenger*, vol. 10, pt. 30, p. 27.
1887. *Nellia oculata* Hincks, On the Polyzoa and Hydroida of the Mergui Archipelago, Journal Linnean Society, Zoology, vol. 21, p. 121.
1887. *Farcimia oculata* Waters, Bryozoa from New South Wales, etc., Annals and Magazine Natural History, ser. 5, vol. 20, p. 92.
1909. *Nellia tenella* Levinsen, Morphologic and Systematic Studies on the Cheilostomatous Bryozoa, p. 120, pl. 1, fig. 13 (ovicell).
1919. *Nellia oculata* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication Carnegie Institution of Washington, No. 291, p. 82, pl. 2, figs. 5–7.
1920. *Nellia oculata* Canu and Bassler, Monograph North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 196, pl. 82, figs. 6–10.

Small fragments of this delicate bryozoan occurring in the Bowden horizon of Santo Domingo are quite sufficient for the determination of the species in the American Miocene. The dimensions of the opesium are not equal on the four sides, one of which is often larger than the others. The authors are not in accord as to the name which should be given to this species. We have adopted that of Busk. The species is discussed on page 196 of our monograph on North American Early Tertiary Bryozoa, where a more detailed bibliography is given the above references being additional ones.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare).

Geological distribution.—Vicksburgian of Mississippi; Lutetian of the environs of Paris (Canu); Helvetian of Egypt (Canu); Miocene of Australia (Waters).

Plesiotypes.—Cat. No. 68471, U.S.N.M.

Family OPESIULIDAE Jullien, 1888.

Genus FLORIDINA Jullien, 1881.

(For description, see Bulletin 106, U. S. National Museum, p. 219.)

FLORIDINA PYRIPORA Canu and Bassler, 1919.

Plate 1, fig. 1.

1919. *Floridina pyripora* CANU and BASSLER, Geology and Paleontology of the West Indies, Bryozoa. Publications Carnegie Institution of Washington, No. 291, p. 82, pl. 2, fig. 2.

The few specimens of this incrusting species which have been collected in the Leeward Islands seem hardly sufficient for the description of a new *Floridina*, because polymorphism is the rule in this genus; but we believe more specimens will prove this to be a good species. The polypidian convexity is little salient; the opesiules are large and poorly defined; the lateral apophyses are very little salient; the general aspect of the opesium is pyriform. The ovicell is endozooecial, smooth, and salient.

Measurements.— Opesia (including opesiules) $\left\{\begin{array}{l} ho = 0.20 \text{ mm.} \\ lo = 0.22 \text{ mm.} \end{array}\right.$

Zooecia $\left\{\begin{array}{l} Lz = 0.48 - 0.50 \text{ mm.} \\ lz = 0.40 - 0.44 \text{ mm.} \end{array}\right.$

Floridina antiqua Smitt, 1872, a recent species in the Gulf of Mexico, is marked by large lateral denticles and by small opesiules, giving it a quite different aspect.

Occurrence.—Oligocene (Antigua formation): Rifle Butts, Antigua, Leeward Islands (rare). Oligocene (Anguilla formation): Southwest side of Crocus Bay, Anguilla, Leeward Islands (rare).

Holotype.—Cat. No. 68472, 68473, U.S.N.M.

FLORIDINA FUSIFERA Canu and Bassler, 1919.

Plate 1, fig. 5.

1919. *Floridina fusifera* CANU and BASSLER, Geology and Paleontology of the West Indies. Bryozoa. Publications Carnegie Institution of Washington, No. 291, p. 83, pl. 1, fig. 3.

Description.—The zoarium is incrusting. The zooecia are hexagonal; the cryptocyst is larger than the opesium; it is of little depth and is finely granulated: the opesium is trifoliate; the lateral apophyses are very salient; the opesiules are large and rounded; the polypidian convexity is very salient and convex. The onychocellarium is large, somewhat constricted laterally, and is provided with a very large orifice. Here and there are small fusiform avicularia.

Measurements.—Opesia $\left\{\begin{array}{l} ho = 0.20 \text{ mm.} \\ lo = 0.18 - 0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.50 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{array}\right.$

Onychocellaria $\left\{\begin{array}{l} \text{Opesium} = 0.30 \text{ by } 0.20 \text{ mm.} \\ \text{Zooecium} = 0.60 \text{ by } 0.36 \text{ mm.} \end{array}\right.$

There are only four zooecia intact on the single zoarium obtained. The presence of small fusiform avicularia has appeared to us sufficient to justify the creation of this species, this feature never having been observed in the genus.

Occurrence.—Oligocene (Antigua formation): Rifle Butts, Antigua, Leeward Islands (very rare).

Holotype.—Cat. No. 68474, U.S.N.M.

FLORIDINA REGULARIS, new species.

Plate 14, fig. 7, 8.

Description.—The zoarium incrusts shells and consists of one or two superposed lamellae. The zooecia are distinct, separated by a furrow, little elongated, hexagonal, regular; the cryptocyst is smooth, somewhat concave, limited laterally by two convergent grooves which end at the opesiules. The apertura is orbicular and forms the distal part of the trifoliate opesium; the polypidian convexity is limited laterally by two linear opesiules. The ovicell is little salient and endozooecial. The onychocellarium is fusiform; its beak is very salient on the zooecial plane; its opesium is anterior.

Measurements (maximum).—Opesia $\left\{\begin{array}{l} ho=0.15 \text{ mm.} \\ lo=0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.40 \text{ mm.} \\ lz=0.35 \text{ mm.} \end{array}\right.$

Affinities.—The marginal zooecia are elongated; the central zooecia are transverse.

This species differs from *Floridina antiqua* Smitt, 1872, in its onychocellarium with salient beak of a different form. It differs from *Floridina parvicella* in its larger micrometric measurements.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (common). Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina (common). Miocene (Yorktown formation): Yorktown, Virginia (rare).

Holotype and paratype.—Cat. Nos. 68475, 68476, U.S.N.M.

FLORIDINA PARVICELLA, new species.

Plate 31, fig. 12.

Description.—The zoarium incrusts oysters. The zooecia are small, hexagonal, little elongated, distinct but with adjacent mural rims; the opesium is trifoliate: the anterior part of aperture is elongate or elliptical; the polypidian convexity is wide and limits two linear and transverse opesiules.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.10 \text{ mm.} \\ lo=0.07 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.38 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{array}\right.$

Affinities.—This species is sufficiently characterized by its small dimensions. It differs again from *Floridina regularis* in the absence of a furrow separating the zooecia.

The genus *Floridina* has been observed in the Cretaceous formations of northern Europe. It has, therefore, in the course of the geologic ages migrated slowly toward the Equator. The Waccamaw marl is its last known stage in America.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (very rare).

Holotype.—Cat. No. 68477, U.S.N.M.

FLORIDINA MINIMA, new species.

Plate 14, fig. 6.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow, *very small*, hexagonal or ogival; the mural rim is wide, convex, little salient, very finely granulated; the cryptocyst is of little depth, somewhat convex and finely granulated. The opesium is elliptical, elongated; the opesiular indentations are large, rectilinear, oblique, limited by a concave proximal border. The ancestrula is very small.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.12 \text{ mm.} \\ lo=0.07 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.35 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{array}\right.$

Affinities.—On our type specimen we have observed neither onychocellaria nor ovicells. This is the smallest species of *Floridina* known. It differs from *Floridina parvicella* in its zooecia separated by a deep furrow and in its smaller opesial dimensions.

Occurrence.—Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina (rare).

Holotype.—Cat. No. 68478, U.S.N.M.

Genus **VELUMELLA** Canu and Bassler, 1917.

(For description, see Bulletin 106, U. S. National Museum, p. 213.)

VELUMELLA ELONGATA, new species.

Plate 14, fig. 5.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow, large, *elongated*, ogival; the mural rim is thin, rounded, granulated, salient; the cryptocyst is shallow, flat, granulated. The opesium is large, semilunar; the opesiular indentations are of little depth, rounded, almost symmetrical. The onychocellarium is large, elongated, straight, acuminate or elliptical; its opesium is median, elongated, elliptical.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.20\text{–}0.25 \text{ mm.} \\ lo=0.20\text{–}0.25 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.55\text{–}0.65 \text{ mm.} \\ lz=0.35\text{–}0.40 \text{ mm.} \end{array}\right.$

Opesium of onychocellarium $\left\{\begin{array}{l} hn=0.35 \text{ mm.} \\ ln=0.15 \text{ mm.} \end{array}\right.$ Onychocellarium $\left\{\begin{array}{l} Lon=0.55\text{–}0.65 \text{ mm.} \\ lon=0.35 \text{ mm.} \end{array}\right.$

Affinities.—In its general aspect, the relations of its dimensions and its frontal granulations, this species much resembles *Vincularia abyssicola* Hincks, 1881 (not Smitt, 1872), from Singapore or the Philippines. It differs from it simply in the absence of lateral facets to the cryptocyst; that is to say, in the peculiarity characterizing *Smittipora*. The onychocellaria are not fusiform as in *Rectonychocella* and *Diplopholeos*.

Occurrence.—Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, North Carolina (rare).

Holotype.—Cat. No. 68479, U.S.N.M.

Genus **MICROPORA** Gray, 1848.

(For description, see Bulletin 106, U. S. National Museum, p. 234.)

MICROPORA CORIACEA Esper, 1794.

1862. *Reptescharellina disparilis* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences Philadelphia, ser. 2, vol. 5, p. 147, pl. 20, fig. 29.

1912. *Micropora coriacea* Barroso, Briozoos de la Estacion de Biologia maritima de Santander, Instituto nacional de Ciencias Fisico naturales, p. 21.

1917. *Micropora coriacea* CANU, Bryozoaires fossiles des Terrains du Sud-Ouest de la France, Bulletin de la Société Géologique de France, ser. 4, vol. 16, p. 135 (cites bibliography).

1920. *Micropora coriacea* CANU and BASSLER, Monograph Early Tertiary Bryozoa of North America, Bulletin 106, U. S. National Museum, p. 235, pl. 4, figs. 20–22.

The only known occurrence in American post Oligocene strata of this well-known recent and fossil bryozoan is in the Pleistocene rocks of California, where it received the name of *Reptescharellina disparilis* Gabb and Horn, 1862. The species is discussed on page 235 of our volume on the North American Early Tertiary Bryozoa, where a more complete bibliography is given.

Occurrence.—Midwayan, Jacksonian, and Vicksburgian of the United States Pleistocene: Santa Barbara, California (rare).

Plesiotype.—Cat. No. 68480, U.S.N.M.

Genus SELENARIA Busk, 1854.

1854. *Selenaria* BUSK, Catalogue marine Polyzoa, pt. 2, p. 101.

The ovicell is endozooecial; it appears on the surface of the colony as low, rounded, pent-roof shaped swellings. The cryptocyst is perforated by the opesiules or limited by the opesiular indentations. The opesium is irregular. The opercular valve is limited by the distal part of the zooecial mural rim. Porous vibracula are disseminated among the zooecia. The zoarium is discoid and cupuliform; its inner surface is perforated by numerous pores. No spines.

Genotype.—*Selenaria maculata* Busk, 1854.

Range.—Claibornian to Recent.

According to Levinsen, who wrote in 1909:

> The vibracula are an arched frontal surface perforated by numerous pores or by slits. A high ribbon-shaped lamina issuing from the one lateral margin in the distal part of the vibracularian chamber stretches over toward the opposite margin and not far from this bends inward toward the basal surface. It serves no doubt for the attachment of the flagellum. Distal wall with two multiporous septules, and the distal half of each lateral wall with a single one. Lateral walls are common to the contiguous neighboring zooecia.

SELENARIA AURICULARIA, new species.

Description.—The zoarium is a *Lunulites* form of 6 mm. in diameter. The zooecia are distinct, separated by a salient and wide mural rim, hexagonal, regular or transverse; the cryptocyst is deep, flat, smooth, and perforated by two large equal opesiules symmetrically arranged. The apertura is elliptical and transverse. The vibracula are very large, auriform, terminated by a short, hooked, small canal. The inner side is perforated by numerous pores regularly arranged on the inner layer and very irregularly disposed on the outer central layer.

Variations.—The zooecia are very irregular in size and we have not been able to discover any constant micrometric measurements. The apertura is likewise irregular in its measurements. The vibracula are larger at the periphery than at the center. The opesiules alone are of the same diameter on all the zooecia.

Affinities.—The form of the opesiules is quite variable in the genus *Selenaria*. They are perforated (as in our American species) in *S. parvipunctata* Maplestone, 1904; *S. bimorphocella* Maplestone, 1904; and *S. magnipunctata* Maplestone, 1904. They are formed by deep lateral indentations in *S. maculata* Busk, 1862. They are transformed into simple, lateral, irregular sinuosities in *S. cupola* Tenison Woods, 1879; *S. concinna* Tenison Woods, 1879; *S. marginata* Tenison Woods, 1879; and *S. otwayensis* Maplestone, 1904. They are very little visible in *S. nitida* Maplestone, 1909, and *S. flagellifera* Maplestone, 1910. The inner face of all the species is porous except in *S. marginata* Tenison Woods, 1879.

Our American species differs from the known forms only in the auriculate form of vibracula. This difference can not form a generic character; first, because the function is the same; second, because porous and cribriform vibracula have been observed in the genus *Coscinopleura* Marsson, 1885, which belongs to another quite distinct family; third, because auriform vibracula analogous to those of our species may be observed in the genus *Otionella* Canu and Bassler, 1917, which does not appear to be opesiulated; fourth, because the large auriform vibracula are possibly porous vibracula which have lost their frontal. There are specimens of *Selenaria maculata* in the National Museum Collections provided with analogous auriculate vibracula.

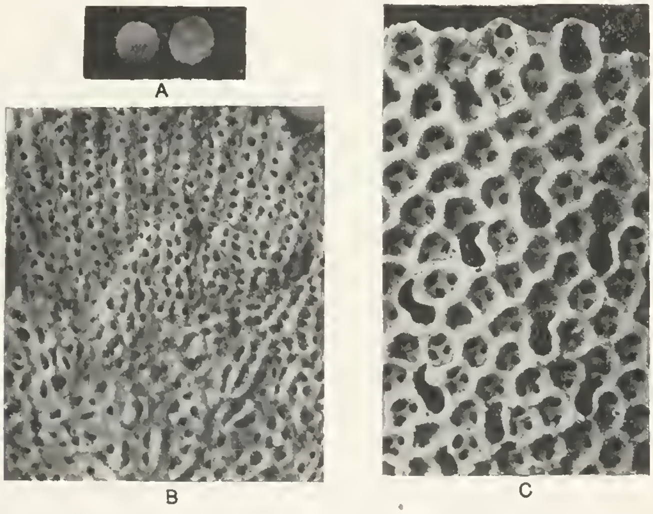


Fig. 5.—Genus *Selenaria* Busk, 1854.
A-C. *Selenaria auricularia*, new species.
A. Zoaria, natural size.
B, C. Noncelluliferous and celluliferous sides, ×20.
Eocene (Claibornian); Claiborne, Alabama.

Occurrence.—Eocene (Claibornian) Gosport sand; Claiborne, Alabama (rare).

Cotypes.—Cat. No. 68481, U.S.N.M.

Family THALAMOPORELLIDAE Levinsen, 1909.

Genus MANZONELLA Jullien, 1888.

1888. *Manzonella* Jullien, Mission scientifique du Cap Horn, VI, Zoologie, Bryozoaires, p. 79.

Opesiules well formed, sometimes multiple. Opesium terminal in the form of an orifice. (After Jullien.)

Genotype.—*Manzonella* (*Membranipora*) *exilis* Manzoni, 1869, Pliocene.

Genus WOODIPORA Jullien, 1888.

1888. *Woodipora* JULLIEN, Mission scientifique du Cap Horn, VI, Zoologie, Bryozoaires, p. 79.

Cryptocyst entirely developed; two regular opesiules; opesium with rounded contour. (After Jullien.)

Genotype.—*Woodipora* (*Membranipora*) *holostoma* (Wood), Pliocene.

Genus THALAMOPORELLA Hincks, 1887.

(For description, see Bulletin 106, U. S. National Museum, p. 268.)

THALAMOPORELLA GRANULATA Levinsen, 1909.

Plate 2, fig. 14.

1909. *Thalamoporella granulata* LEVINSEN, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 188, pl. 6*a*, figs. 1, 2; pl. 6, fig. 5.
1914. *Thalamoporella granulata* OSBURN, The bryozoa of the Tortugas Islands, Florida, Publication Carnegie Institution of Washington, No. 182, p. 197, fig. 8.
1919. *Thalamoporella granulata* CANU and BASSLER, Geology and Paleontology of the West Indies, Bryozoa, Publications Carnegie Institution of Washington, No. 291, p. 88, pl. 2, fig. 14.

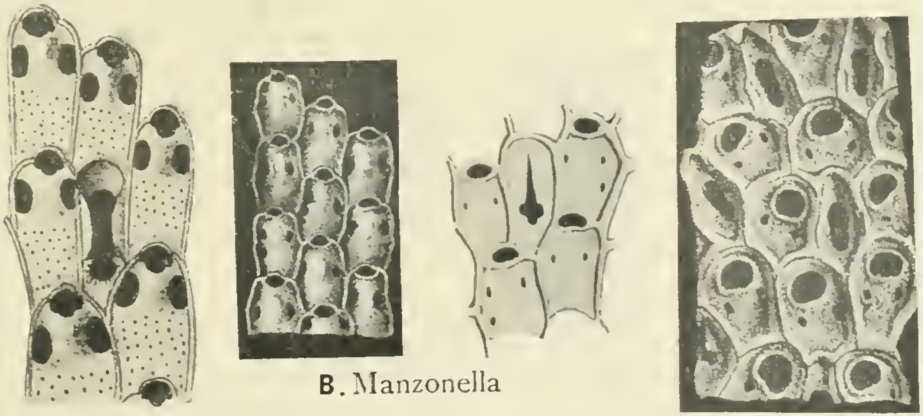

B. Manzonella
A. Thalamoporella
C. Woodipora

FIG. 6.—Genera of the family Thalamoporellidae Levinsen, 1909.
A. *Thalamoporella rozieri* Audouin, 1826, ×25 (after Waters, 1908).
B. *Manzonella exilis* Manzoni, 1870 (after Manzoni, 1870, and Neviani, 1895).
C. *Woodipora holostoma* Busk, 1859, ×25.

Measurements.—Opesia $\begin{cases} ho = 0.16\text{–}0.18 \text{ mm.} \\ lo = 0.16\text{–}0.18 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.80 \text{ mm.} \\ lz = 0.50 \text{ mm.} \end{cases}$

Affinities.—We possess only a small fragment consisting of two zooecia; we are not certain therefore of our determination, as this has been made almost entirely on the micrometric measurements. The opesium is oval, the point above; the cryptocyst is granulated; the mural rim has a width of 0.08 mm. and is granulated transversally.

Occurrence.—Lower Miocene (Bowden horizon): Rio Gurabo, Santo Domingo (rare).

Habitat.—Andaman or Nicobar Islands? (Levinsen); Tortugas Islands, Florida (Osburn).

Plesiotype.—Cat. No. 68482, U.S.N.M.

THALAMOPORELLA BIPERFORATA Canu and Bassler, 1919.

Plate 6, figs. 10–15.

1919. *Thalamoporella biperforata* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication Carnegie Institution of Washington, No. 291, p. 88, pl. 6, figs. 10–15,

Description.—The zoarium is bilamellar. The zooecia are elongate, distinct rectangular; the mural rim is thin, salient, bevelled, and bears two hollow tubercles on each side of the aperture. The cryptocyst is deep, flat, ornamented with large widely spaced pores and with numerous small pores closely placed together; the opesiules are very large, far distant from the apertura, placed symmetrically, but very unequal in size. The apertura is transverse, oval; the proximal border is always concave and the polypidian tube is limited by two small lateral indentations. The reticulocellarium is large, quite elongate; its cryptocyst is perforated by two opesiules; the opesium bears two lateral denticles serving as pivot to the corneous mandible.

Measurements.—Opesium of zooecium ----- { *ho* = 0.10–0. 12 mm.
lo = 0.14 mm.

Zooecium ---------------- { *Lz* = 0.54–0.60 mm.
lz = 0.34–0.40 mm.

Opesium of onychocellarium - { *hon* = 0.24 mm.
lon = 0.12 mm.

Onychocellarium---------- { *Lon* = 0.90 mm.
lon = 0.30 mm.

Affinities.—The oral tuberosities are quite variable in size; they are often replaced by two fossettes.

This species is characterized by its onychocellarium, which resembles that of *Thalamoporella granulata* Levinsen, 1909, figured by Osburn, 1914. It differs, however, in the very different oval form of its apertura and in the presence of oral tuberosities. In its tuberosities this species is quite close to *Thalamoporella rozieri* Savigny-Audouin, 1826. It differs from it in the form of its onychocellarium provided with two opesiules, which are not figured by Levinsen in the numerous drawings which he has given.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Rio Cana and Rio Gurabo, Santo Domingo; and Bowden, Jamaica (common).

Cotypes.—Cat. No. 68483, 68484, U.S.N.M.

Family STEGANOPORELLIDAE Levinsen, 1909.

Genus **STEGANOPORELLA** Smitt, 1873.

(For description see Bulletin 106, U. S. National Museum, p. 259.)

STEGANOPORELLA PARVICELLA Canu and Bassler, 1919.

Plate 6, figs. 6–9.

1919. *Steganoporella parvicella* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication of the Carnegie Institution No. 291, p. 89, pl. 6, figs. 6–9.

Description.—The zoarium is unilamellar incrusting algae or bryozoa. The zooecia are distinct, elongate, separated by a shallow furrow; the mural rim is thin, salient, finely granular. The cryptocyst is finely porous; the opesium is irregular or semilunar, a little elongate; the polypidian tube forms a rectangular surface, salient and excentric between the two dissimilar opesiular indentations. The large zooecia (B) are provided with a wide distal floor, and the polypidian tube is almost median.

Measurements.—	
Opesium of small (a) zooecia	*ho* = 0.34–0.36 mm. *lo* = 0.16–0.30 mm.
Small (a) zooecia	*Lz* = 0.50–0.76 mm. *lz* = 0.50 mm.
Opesium of large (B) zooecia	*ho* = 0.24–0.30 mm. *lo* = 0.36–0.40 mm.
Large (B) zooecia	*Lz* = 1.00–1.10 mm. *lz* = 0.44–0.56 mm.

Affinities.—The dimensions are quite variable, but they are always smaller than those of *Steganoporella magnilabris* Busk, 1854, which this species resembles in all its other characters.

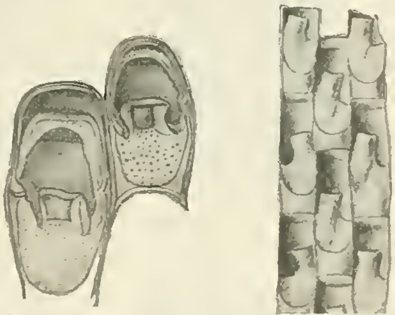


Fig. 7.—Genera of the family Steganoporellidae Levinsen, 1909.

A. *Steganoporella* Smitt, 1873. *S. magnilabris* Busk, 1852. Recent. (After Harmer, 1900.)

B. *Siphonoporella* Hincks, 1880. *S. delicatissima* Busk, 1840, ×40. Recent. (After Levinsen, 1909.)

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare) and Bowden, Jamaica (common).

Cotypes.—Cat. Nos. 68485, 68486, U.S.N.M.

STEGANOPORELLA MAGNILABRIS Busk, 1854.

Plate 14, figs. 12, 13.

1854. *Membranipora magnilabris* Busk, Catalogue Marine Polyzoa, British Museum, pt. 2, Cheilostomata, p. 62, pl. 65, fig. 4.

1872. *Steganoporella elegans* Smitt, Floridan Bryozoa, collected by Count Pourtales, Pt. I. Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 10, No. 11, p. 15, pl. 4, figs. 96–101.

1890. *Steganoporella magnilabris* Harmer, A revision of the Genus Steganoporella, Quarterly Journal Microscopical Science, vol. 43, p. 279, pl. 12, fig. 10; pl. 31, figs. 44–46 (cites bibliography).

1909. *Steganoporella magnilabris* Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, pp. 167, 168.

1913. *Steganoporella magnilabris* WATERS, Bryozoa from Zanzibar, Proceedings Zoological Society, London, p. 498, pl. 72, figs. 12–20 (cites bibliography).

1914. *Steganoporella magnilabris* OSBURN, The bryozoa of the Tortugas Islands, Florida, Publication Carnegie Institute, Washington, No. 182, p. 196.

Measurements.—Apertura of small (a) zooecia $\begin{cases} ha = 0.42\text{–}0.44 \text{ mm.} \\ la = 0.40 \text{ mm.} \end{cases}$

Zooecia (a) $\begin{cases} Lz = 0.46\text{–}0.48 \text{ mm.} \\ lz = 0.42\text{–}0.46 \text{ mm.} \end{cases}$

Apertura of large (B) zooecia $\begin{cases} ha = 0.46\text{–}0.48 \text{ mm.} \\ la = 0.42\text{–}0.46 \text{ mm.} \end{cases}$

Zooecia (B) $\begin{cases} Lz = 1.20 \text{ mm.} \\ lz = 0.60 \text{ mm.} \end{cases}$

The zoaria are bilamellar; the two lamellae are easily separated. The micrometric measurements given by Harmer are quite variable; ours are more constant and always greater than those in *Steganoporella parvicella.*

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ochlocknee River, 25 miles southwest of Tallahassee, Florida (very rare). Pliocene (Caloosahatchee marl); Monroe County, Florida (very rare).

Habitat.—Western Atlantic: Off Florida (24–59 meters), Jamaica (16–19 meters), St. Vincent, Brazil (32 meters). Western Pacific: Off Japan (324 meters), China Sea (43 meters), Philippines (29 meters), Singapore to Honolulu (32–64 meters), Queensland (19–32 meters). Indian Ocean: Trincomalie, Admirality Islands (32–40 meters), East Africa (3–16 meters).

Plesiotypes.—Cat. No. 68487, U.S.N.M.

Family ASPIDOSTOMIDAE Canu, 1908.

Genus ODONTIONELLA Canu and Bassler, 1917.

1917. *Odontionella* CANU and BASSLER, A Synopsis of American Early Tertiary Cheilostome Bryozoa, U. S. National Museum, Bull. 96, p. 12.

1920. *Odontionella* CANU and BASSLER, Monograph North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 256.

Ovicell hyperstomial. No condyle for the opercular valve. The opesium is not symmetrical. The proximal border of the opesium bears irregular spinous processes, short, flat, more or less wide. The opesiular indentations are dissymmetrical. The operculum projects beyond the ridge. Sixteen tentacles. The avicularium is placed on the gymnocyst.

Genotypes.—Odontionella (*Membranipora*) *hians* Hincks, 1885, and *Odontionella* (*Membranipora*) *occultata* Waters, 1887. Range: Pliocene-Recent.

In 1917 we gave the generic definition of Waters's *M. hians* group. Later studies have permitted us to gain a better knowledge of the structure of this remarkable genus, which must be definitely placed in the Aspidostomidae on account of the nature of the ovicell. The genus differs from *Hemiseptella* Levinsen, 1912, also deprived of condyles in the nature of the opercular valve, in the presence of a gymnocyst and of a sort of vestibular arch, in the rarity of the lateral processes, and in the presence of an ovicell. The retractor muscles of the polypide are attached in one of the zooecial angles. This results in a dissymmetry of the opesium and of the opesiules as in *Steganoporella*, *Onychocella*, etc.

Like Waters, 1899, we have thought that *Membranipora savartii* Audouin, 1826, belonged to this group of species. It is in fact also provided with spinous processes and rather frequently with a proximal denticular plate. But this analogy is not sufficient; for, first, the opesium is symmetrical; second, we do not know whether there are opesiules in the chitinous cryptocyst; third, the operculum is totally different; and, fourth, there are only 15 tentacles.

The characteristics of this genus are much more visible on *Membranipora occultata* Waters, 1887, wherefore we believe it wise to add it as a second genotype.

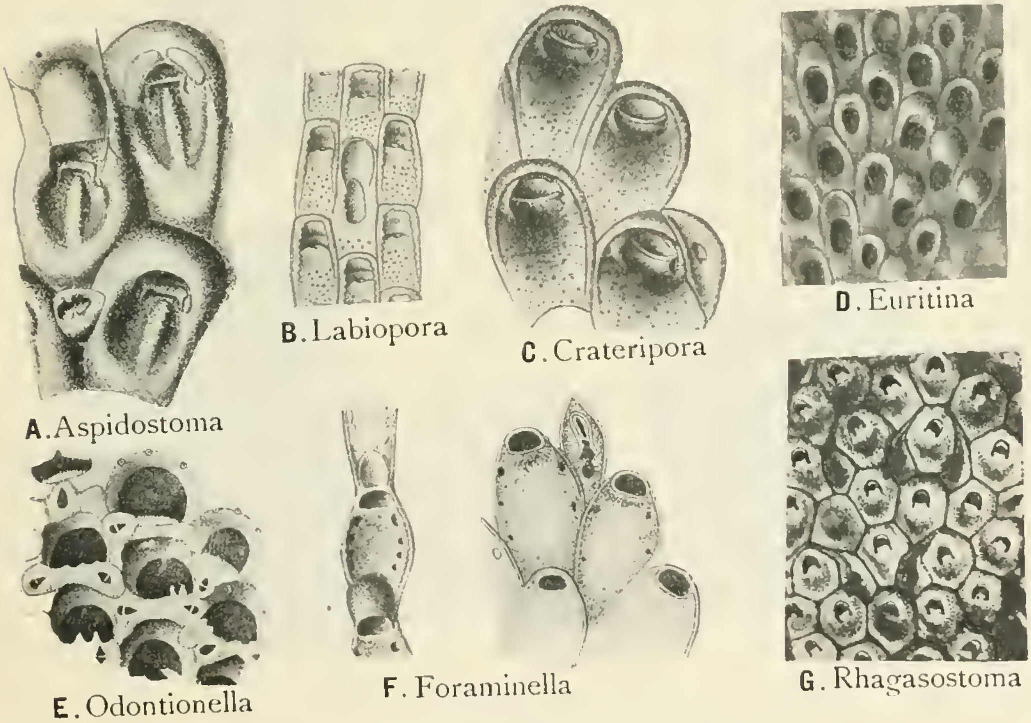


Fig. 8.—Genera of the family Aspidostomidae Canu, 1908.

A. *Aspidostoma*, Hincks, 1881. *A. giganteum* Busk, 1884, × 25. Recent.
B. *Labiopora* Levinsen, 1909. *L. crenulata* Levinsen, 1909, × 23. Recent.
C. *Crateropora* Levinsen, 1909. *C. falcata.* Levinsen, 1909, × 23. Recent. (A–C after Levinsen, 1909.)
D. *Euritina* Canu, 1900. *E. eurita* D'Orbigny, 1852, × 20. Cretaceous.
E. *Odontionella* Canu and Bassler, 1917. *O. occultata* Waters, 1887. (After Waters, 1887.)
F. *Foraminella* Levinsen, 1909. *F. lepida* Hincks, 1881, × 25. Recent. (After Hincks, 1881.)
G. *Rhagasostoma* Koschinsky, 1885. *R. hexagonum* Koschinsky, 1885, ×17. Eocene. (After Koschinsky, 1885.)

Genus FORAMINELLA Levinsen, 1909.

1909. *Foraminella* LEVINSEN, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 165.

The somewhat arched frontal wall has no pores, but on each side a longitudinal series of (1–5) foramina (opesiules). A membranous opercular valve. Independent avicularia without crossbar, with an elongate mandible, on the one side furnished with a wing-like expansion. Hyperstomial ovicell with a membraneous ectooecium. Dietellae (Levinsen).

Genotype.—Foraminella (*Monoporella*) *lepida* Hincks, 1881. Recent.

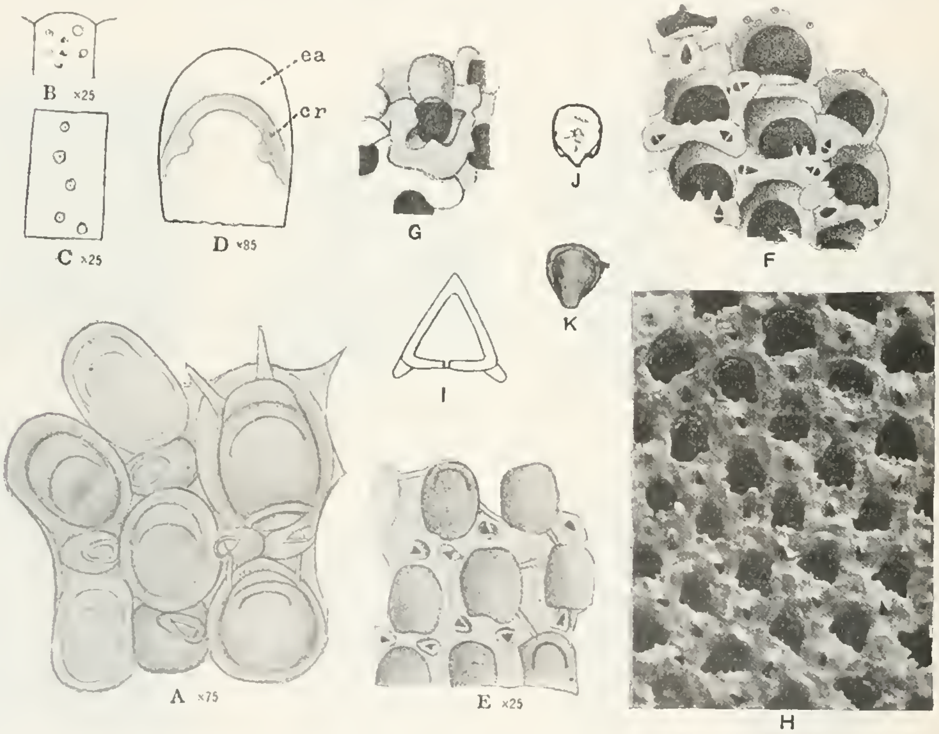


FIG. 9—Genus *Odontionella* Canu and Bassler, 1917.

A–E. *Odontionella* (*Membranipora*) *hians* Hincks, 1885.

A. Zooecia, × 75. (After Hincks, 1885.) B. Distal wall with septulae, × 25. C. Lateral wall with septulae, × 25. D. Operculum, × 85, showing chitinous ridge (*cr*) and expansion (*ea*). E. Zooecia × 25. (B–E after Waters, 1898.)

F, G, I. *Odontionella occultata* Waters, 1887.

F. Specimen from recent seas with its avicularia. G. Example from the Tertiary rocks of New Zealand showing a thick calcareous deposit between the zooecia. I. Avicularian mandible, × 250.

J, K. Opercula of another species (introduced by error.).

H. Photograph of a specimen of *Odontionella hians* Hincks from New Zealand showing the disymmetry of the opesiular indentations, × 20.

Genus LABIOPORA Levinsen, 1909.

(For description, see Bulletin 106, U. S. National Museum, p. 258.)

LABIOPORA MIOCENICA Canu and Bassler, 1919.

Plate 6, fig. 1.

1919. *Labiopora miocenica* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication of the Carnegie Institution of Washington, No. 291, p. 89, pl. 6, fig. 1.

Description.—The zoarium is unilamellar. The zooecia are elongate, distinct, rectangular; the mural rim is quite thin, round. The cryptocyst is little deep, flat, and formed of a tremocyst superposed on an olocyst perforated with corresponding pores. The opesium is tranverse, terminal or placed at the base of a funnel, formed by the much developed vestibular arch. The polypidian tube is visible, wide, median.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.10 \text{ mm.} \\ lo=0.24\text{–}0.28 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{–}0.64 \text{ mm.} \\ lz=0.32\text{–}0.34 \text{ mm.} \end{array}\right.$

Affinities.—This new species differs from *Labiopora crenulata* Levinsen, 1909, in the wide form of the zooecia and in its transverse opesium.

Occurrence.—Lower Miocene (Bowden horizon): Rio Gurabo, Santo Domingo (rare).

Holotype.—Cat. No. 68488, U.S.N.M.

CALPENSIIDAE, new family.

No ovicell. The cryptocyst is perforated by one or two opesiules.

We suppose that the ovicell is formed by an internal sac placed in the vicinity of the opercular region as in the genus *Diplodidymia* Reuss, 1869. The different genera which we classify here belong perhaps to distinct families; but as we are ignorant of the larva, it is preferable to group them provisionally under the same name. They may be classified in three groups.

1. A single opesiule. *Diplodidymia* Reuss, 1869.
2. Cryptocyst with spinous processes. *Hemiseptella* Levinsen, 1909; *Cupularia* Lamouroux, 1821.
3. Complete cryptocyst. *Calpensia* Jullien, 1888; *Verminaria* Jullien, 1888; *Microporina* Levinsen, 1909; *Corynostylus* Canu and Bassler, 1919.

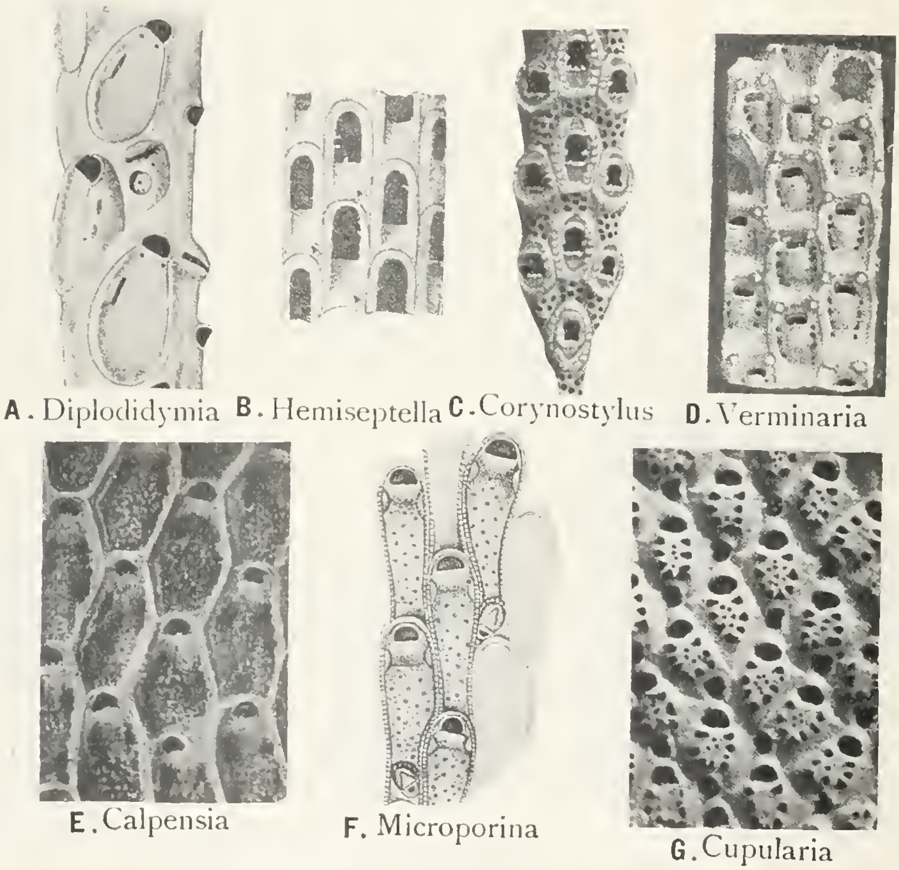
Genus DIPLODIDYMIA Reuss, 1869.

1869. *Diplodidymia* Reuss, Zur fossilen Fauna der Oligocänschichten von Gaas, Sitzungsberichte der k. Akademie der Wissenschaften, Wien, vol. 59, Abth. 1, p. 469.

The zoarium is articulated and radicelled. Each segment is formed of four rows of zooecia placed diagonally. No ovicell. Two very small pores are placed on each side before the apertura. The cryptocyst is perforated laterally by a long linear opesiule; it gives passage to the wide muscles attached to the ectocyst in a seclerity (=chitinous thickening). The avicularium is by the side of the apertura and the mandible is triangular. The avicularian chamber bears a radicular perforation. Eleven to twelve tentacles.

Genotype.—*Diplodidymia complicata* Reuss, 1869. Range: Montian-Recent.

A detailed study of this genus was made by Waters, 1913. The ovicell is a sac hanging from the opercular region; the egg evolves there until the formation of the larva. Reuss classified this genus in a special family.



A. Diplodidymia **B.** Hemiseptella **C.** Corynostylus **D.** Verminaria

E. Calpensia **F.** Microporina **G.** Cupularia

Fig. 10.—Genera of the family Calpensiidae, new family.

A. *Diplodidymia* Reuss, 1869, *D. complicata* Reuss, 1869, × 85. Recent, Africa. (After Waters, 1913.)

B. *Hemiseptella* Levinsen, 1909, *H. labiata* Busk, 1884, × 12. Recent, Cape Horn. (After Waters, 1895.)

C. *Corynostylus* Canu and Bassler, 1919, *C. labiatus* Canu and Bassler, 1919, × 20. Miocene.

D. *Verminaria* Jullien, 1888, *V. oblonga* Busk, 1859. Crag of England. (After Busk, 1859.)

E. *Calpensia* Jullien, 1888, *C. impressa* Moll, 1803, × 25. Recent, Atlantic. (After Guerin-Ganivet.)

F. *Microporina* Levinsen, 1909, *M. elongata* Hincks, 1880 × 25. Recent, Australia. (After Hincks, 1801.)

G. *Cupularia* Lamouroux, 1821. *C. umbellata* Defrance 1823, × 20.

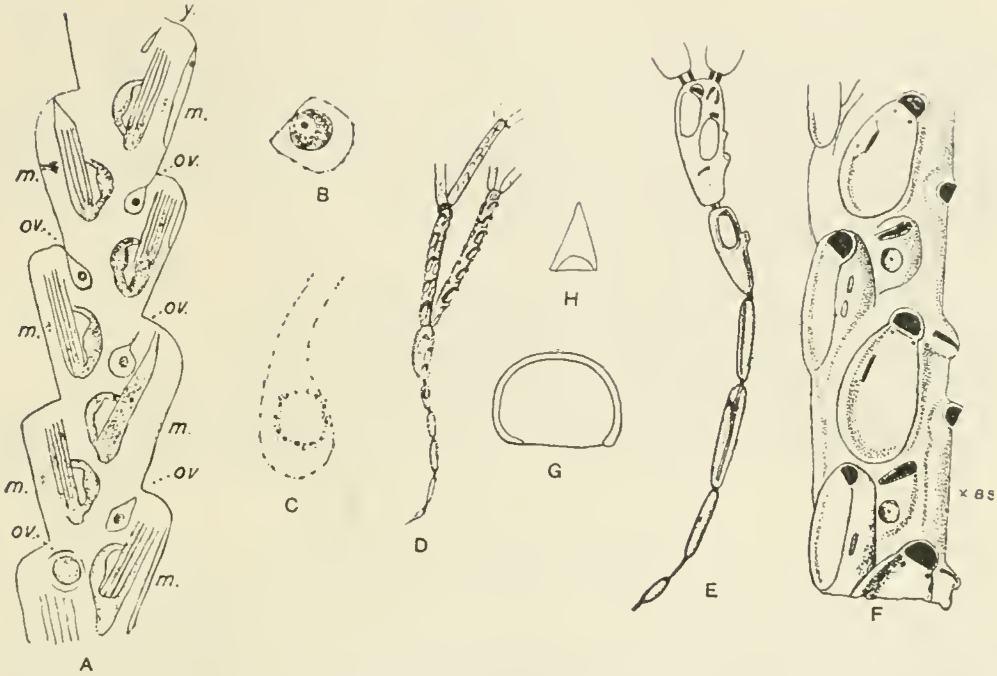


Fig. 11.—Genus *Diplodidymia* Reuss, 1869.

Figs. A–H. *Diplodidymia complicata* Reuss, 1869.

A. Sketch, × 50 showing small sacs hanging from the opercular region, and in each an ovum grows (*ov*). At *y*. there seems as yet no ovum in the small sac; *m*., the muscles of the opesium. B. Section showing an ovum in the small sac, × 750. C. Section, × 750, in which the ovum has segmented and a blastula has formed. D. Colony from Chuaka, Africa, × 6. E. Lower part of colony, × 25. F. Portion of zoarium, × 85, showing the structure of the zooecia and avicularia. G. Operculum, × 250. H. Mandible of the avicularium, × 250. (A–H, after Waters, 1913.)

Genus HEMISEPTELLA Levinsen, 1909.

1909. *Hemiseptella* Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 164.

No ovicell. The distal extremity of the cryptocyst plunges into the zooecium. The dissymmetric opesium bordered laterally and inferiorly by spines. The two opesiules, distinct or not are limited sometimes by the cryptocyst, sometimes by the spinous processes. The opercular valve is garnished superiorly by an opercular arch strongly chitinized. Small avicularium. Twenty-six tentacles.

Genotype.—Hemiseptella (*Vincularia*) *labiata* Busk, 1884. Range: Miocene-Recent.

Structure.—We have chosen *Vincularia labiata* as the genotype because it presents two sorts of spinous processes, the larger of which can unite in order to form a bridge intended to support the hinge of the opercular valve. But this bridge is only a secondary character. The cryptocyst covers the spinous processes. Levinsen attributed to this genus a certain number of species from the Cretaceous figured by D'Orbigny. This is an error; these species belong to the genus *Floridina*, for their ovicell is endozooecial and they bear onychocellaria.

One must not confuse the spinous processes or spinules with the spines. Their structure is not similar and their physiologic rôle is absolutely distinct. The spinous processes are here only internal apparatus for support, probably intended to limit the movements of the hypostege.

The large retractor muscle of the polypide is inserted in a corner of the zooecium as in *Onychocella*, *Odontionella*, and *Steganoporella*. It results in a great dissymmetry of the opesium especially on its proximal border.

The known species of this genus are:

Hemiseptella (*Vincularia*) *labiata* Busk, 1884.
Hemiseptella (*Vincularia*) *steganoporoides* Goldstein, 1882.
Hemiseptella (*Thalamoporella*) *michaelseni* Calvet, 1904.
Hemiseptella (*Biflustra*) *denticulata* Smitt, 1872.
Hemiseptella (*Membranipora*) *tenuis* Desor, 1848.
Hemiseptella (*Membranipora*) *lacinia* Tuomey and Holmes, 1857.
Hemiseptella (*Membranipora*) *minor* Canu, 1908 (*M. sulcata*, var. *minor* Canu).

HEMISEPTELLA LATA Canu and Bassler, 1919.

Plate 2, fig. 4.

1919. *Hemiseptella lata* CANU and BASSLER, Geology and Paleontology of the West Indies, Bryozoa Publication of the Carnegie Institution of Washington, No. 291, p. 85, pl. 2, fig. 4.

Description.—The zoarium incrusts fronds of the bryozoan *Metrarabdotos*. The zooecia are distinct, little elongated, wide, subrectangular; the mural rim is thin. The opesium is elliptical or orbicular, never symmetrical; the cryptocyst is short, little deep, irregular; the opesiular indentations are represented by two lateral dissymmetric concavities and are often separated by a wide and serrate denticle.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.30 \text{ mm.} \\ lo=0.22\text{–}0.30 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.42 \text{ mm.} \\ lz=0.30\text{–}0.32 \text{ mm.} \end{array}\right.$

Affinities.—It is always difficult to characterize a species from the study of a single specimen. Exteriorly the zooecia have the form of certain zooecia observed in *Acanthodesia savartii* Savigny-Audouin, 1826; it differs from it in its nonsymmetric opesium and in two opesiular sinuosities.

This species differs from *Biflustra savarti* Smitt, 1872, which is not perhaps the species of Audouin, in the more constant development of its cryptocyst and in the nature of its zoarium, which does not incrust algae. The proximal denticle has been clearly observed on three zooecia.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (very rare).

Holotype.—Cat. No. 68498, U.S.N.M.

HEMISEPTELLA? LACINIA Tuomey and Holmes, 1857.

Plate 14, fig. 10.

1857. *Membranipora lacinia* TUOMEY and HOLMES, Pleiocene Fossils of South Carolina, p. 14, pl. 4, fig. 10.

We have been unable to find any specimens corresponding to the figure of *Membranipora lacinia*, which, moreover, is somewhat confusing, although probably indicating the genus *Hemiseptella*. We reproduce the original figure in the hope that some future student will rediscover the species.

Occurrence.—Miocene?: Smith's, Goose Creek, South Carolina.

HEMISEPTELLA GRANDICELLA Canu and Bassler, 1919.

Plate 5, fig. 12.

1919. *Hemiseptella grandicella* CANU and BASSLER, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, No. 291, p. 84, pl. 5, fig. 11.

Description.—The zoarium incrusts shells. The zooecia are large, elongate, ogival, distinct, separated by a furrow of little depth; the mural rim is narrow, little salient, round, finely granulated; the cryptocyst is large, flat, granulated; the opesium is elongated, elliptical, irregular and nonsymmetrical in the proximal portion.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.40 \text{ mm.} \\ lo=0.25 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.65\text{–}0.70 \text{ mm.} \\ lz=0.35 \text{ mm.} \end{array}\right.$

Affinities.—The group of inferior opesiular spines was certainly dissymmetrical; trace of the lateral spines is scarcely visible on our specimens.

This species differs from *Hemiseptella denticulata* Smitt, 1872, in the absence of nodosities in the interzooecial angles and in the nontrifoliate opesium. It differs from *Hemiseptella tenuis* Desor, 1848, in the larger micrometric measurements and in the more fragile and less numerous spines.

Occurrence.—Lower Miocene (Bowden marl): Bowden, Jamaica (rare).

Holotype.—Cat. No. 68490, U.S.N.M.

HEMISEPTELLA FILIMARGO, new species.

Plate 10, fig. 9.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a very thin salient *thread*, elongated, subhexagonal; the mural rim is very thin, filiform, salient; the cryptocyst is large, flat, shallow. The opesium is semielliptical, transverse, with an irregular proximal border, two large lateral spicules and many spicules placed inferiorily.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.12\text{–}0.18 \text{ mm.} \\ lo=0.15\text{–}0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.40\text{–}0.50 \text{ mm.} \\ lz=0.25\text{–}0.30 \text{ mm.} \end{array}\right.$

Variations.—The micrometric measurements are very irregular. Interzooecial tubercles are sometimes present. On our single specimen the spicules are badly preserved. The extreme thinness of the mural rim well characterizes this species. Cases of regenerated zooecia have been observed.

Occurrence.—Miocene (Yorktown formation): York River, Virginia (very rare).

Holotype.—Cat. No. 68491, U.S.N.M.

HEMISEPTELLA TUBEROSA, new species.

Plate 46, fig. 10.

Description.—The zoarium incrusts shells. The zooecia are distinct, elongated, rectangular, ornamented with large interzooecial *tubercles*; the mural rim is thick, rounded, granulated; the cryptocyst is much reduced, deep, granulated. The opesium is elongated, elliptical, with an irregular proximal border.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.25 \text{ mm.} \\ lo=0.15 \text{ mm.} \end{array}\right.$ Zooecia $\begin{array}{l} Lz=0.35 \text{ mm.} \\ lz=0.25 \text{ mm.} \end{array}$

Variations.—On our type specimen there are very few spicules visible. The micrometric measurements are very irregular.

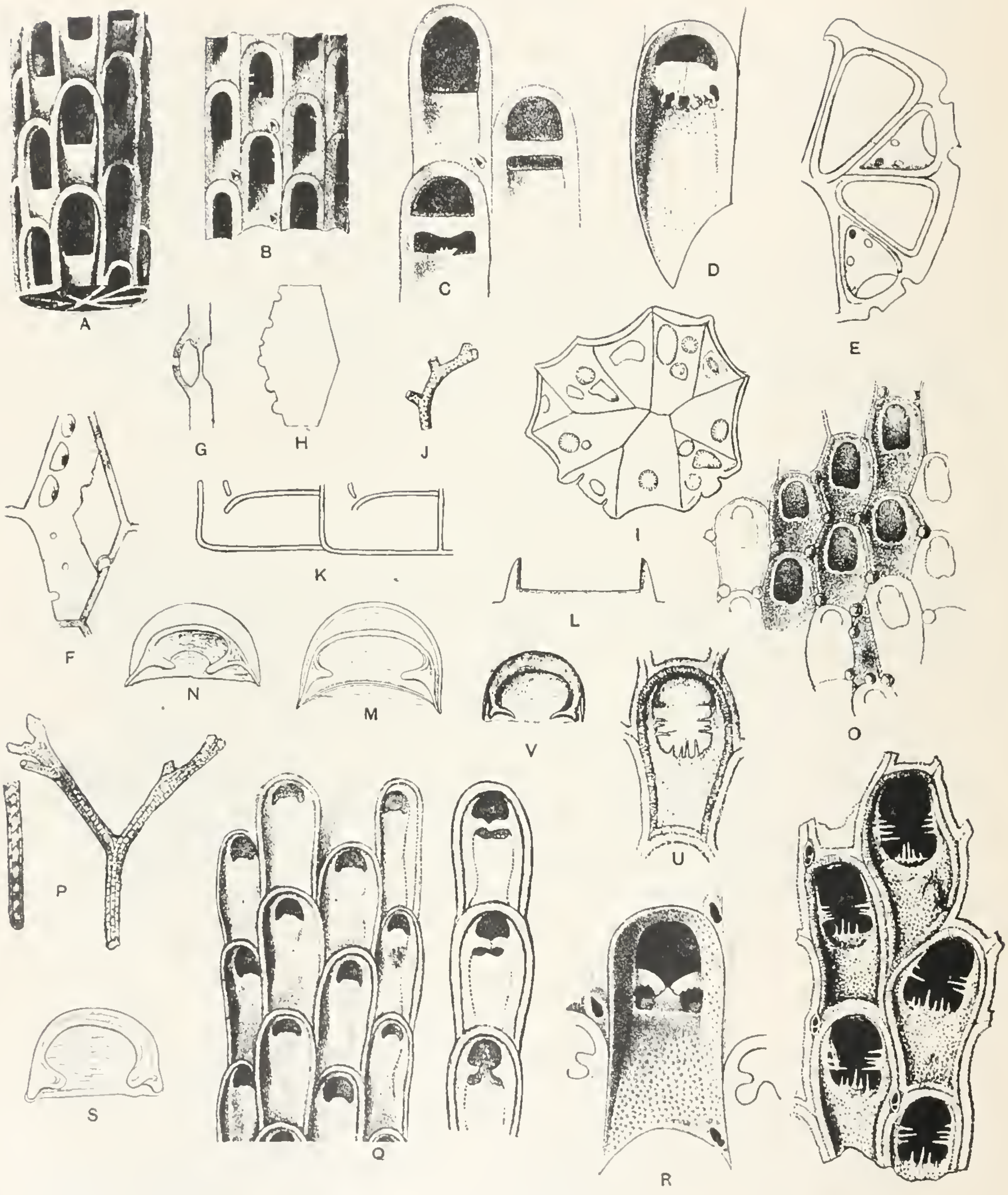

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FIG. 12.—Genus *Hemiseptella* Levinsen, 1909.

FIG. 12.—Genus *Hemiseptella* Levinsen, 1919.

Figs. A–N. *Hemiseptella labiata* Busk, 1884.

A. A branch of the form *Vincularia elegans* (after D'Orbigny, 1839). B. A branch from Cape Horn, × 12. A few minute denticles or hooks occur on the border of the opesium. C. Several zooecia of the type of *Vincularia elegans* preserved at the Museum of Paris. A growth from each side forms a calcareous bridge over the opesium. It is placed under the membraneous ectocyst. D. A calcined zooecium of a specimen from the Atlantic (*Challenger* collection), × 25. E. Transverse section, × 25. F. Calcareous section diagonally through a zooecium, thus showing the projecting rosette plates (septulae), × 25. G. Section through the dietellae, × 250. H. Diagrammatic section showing the position of the septulae, × 25. I. Transverse, decalcified section, × 25. J. A branch, natural size (after D'Orbigny, 1839). K. Section in the zooecia, × 25. Besides the lip which projects upward, the front wall of the zooecium is directed downward thus contracting the zooecium near the aperture. (Figs. D–H, K, (after Waters, 1889). L. Transverse section in operculum, × 85 (B, C, I, L, after Waters, 1895). M., N. Operculum (after Busk 1884).

FIG. O. *Hemiseptella denticulata* Smitt 1872. A zoarium from Florida. The unshaded zooecia are covered by the ectocyst. They show the chitinous arch of the opercular valve.

Fig. P–S.—*Hemiseptella steganoporoides* MacGillivray, 1881. P. A zoarium, natural size, from Prince Edward Island. Q. Zooecia with their opesiular in dentations and occasionally the bridge, × 25 (forma *Vincularia gothica*). R. A zooecium showing the sutures between the three processes and the avicularium (after Waters, 1889). S. Operculum, × 85 (figs. P, Q and S, after Busk, 1884).

Figs. T–V.—*Hemiseptella michaelseni* Calvet, 1904. T. Zooecia, × 25, showing the three groups of spinous processes bordering the opesium. U. A zooecium covered by its membranous transparent ectocyst under which the spinous processes are seen. V. Operculum, × 85 (T–V, after Calvet, 1907).

This species is much smaller than *Hemiseptella rectangulata,* in which the form of the zooecia is identical but which is deprived of tubercles.

Occurrence.—Pleistocene: Simmons Bluff, Yonges Island, Charleston County, South Carolina (rare).

Holotype.—Cat. No. 68492, U.S.N.M.

HEMISEPTELLA FISTULA Ulrich and Bassler, 1904.

Plate 14, fig. 9.

1904. *Membranipora fistula* ULRICH and BASSLER, Bryozoa: Maryland Geological Survey, Miocene, p. 413, pl. 112, fig. 5.

The original description is as follows:

> Zoarium so far as observed forming small, hollow, subcylindrical stems, about 1.5 mm. in diameter, composed of twelve to fifteen longitudinal rows of zooecia. Walls about as wide as the zooecial openings, obtusely carinate, the carinae between the ends of the cells high and bent forward so as to impart a slightly imbricating appearance to successive cells. Opesial opening elongate elliptical; immediately behind it a minute pore is occasionally noticeable. Measuring longitudinally about 8 zooecia in 5.0 mm. No avicularian nor vibracular cells observed.

The original description of this slender rod-like bryozoan gives an adequate idea of the species, of which unfortunately no more specimens have been discovered. We reproduce a new illustration of the type specimen which shows spines irregularly distributed on the proximal border of the opesium, thereby causing the species to be referred to *Hemiseptella.*

Occurrence.—Miocene (St. Mary's formation): St. Mary's River, Maryland (very rare).

Holotype.—Cat. No. 68493, U.S.N.M.

HEMISEPTELLA RECTANGULATA, new species.

Plate 14, fig. 11.

Description.—The zoarium incrusts shells. The zooecia are distinct, adjacent, elongated, rectangular, with rounded distal border. The cryptocyst is deep, granular, flat; the opesium is elliptical, elongated with a proximal border irregular and without symmetry; the spinous processes are short, fragile, thin, numerous. No dietellae.

Measurements.—Opesia$\left\{\begin{array}{l} ho=0.30\text{ mm.}\\ lo=0.20\text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.47\text{ mm.}\\ lz=0.22\text{ mm.}\end{array}\right.$

The spinous processes are very fragile; they little resist fossilization, but their vestiges are easily observed.

Affinities.—This species differs from *Hemiseptella granulosa* in its smooth mural rim and its smaller micrometric measurements. It differs from *Hemiseptella grandicella* in its deep cryptocyst and its smaller micrometric measurements.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (rare).

Holotype.—Cat. No. 68494. U.S.N.M.

HEMISEPTELLA GRANULOSA, new species.

Plate 29, fig. 8.

Description.—The zoarium is unilamellar. The zooecia are distinct, separated by a furrow of little depth, elongated, rectangular; the mural rim is thin convex, granular; the cryptocyst is of little depth, flat, slightly granular. The opesium is elliptical, irregular on its proxial border which is never symmetrical; the spinous processes are distributed in the lower half and the proxial bundle is wider and more salient.

Measurements.—Opesia$\left\{\begin{array}{l} ho=0.40\text{ mm.}\\ lo=0.20\text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.70\text{ mm.}\\ lz=0.35\text{ mm.}\end{array}\right.$

Affinities.—The micrometric measurements are quite variable, even on a simple zoarium; but the relationship of one-half between the two dimensions remain rather constant.

This species differs from *Hemiseptella planulata*, in which the cryptocyst is also very superficial in its granulated mural rim and in its crenulated opesium. It differs from *Hemiseptella grandicella* in its micrometric measurements, generally smaller, and in its granular mural rim.

The spinous processes are rather fragile; only their base resists fossilization, and they appear to be grouped into three bundles. The lowest one is wide and vigorous. The asymmetry of the proximal border of the opesium seems to indicate that the large retractor muscle of the polypide was inserted, not in the median axis of the zooecium, but in a lower corner, as in *Onychocella* and *Steganoporella*.

Occurrence.–Miocene: Near Charleston, South Carolina (very rare).

Holotype.—Cat. No. 68495, U.S.N.M.

HEMISEPTELLA PLANULATA, new species.

Plate 29, figs. 5, 6.

Description.—The zoarium incrusts shells (*Pectunculus*). The zooecia are distinct, elongated, with adjacent mural rims, hexagonal, ogival; the mural rim is thin, little salient; the cryptocyst is little deep, large, flat. The opesium is ogival or subtrifoliate; the mural rim is thin, little, salient; the cryptocyst is little deep, large, *flat*. The spinous processes are very fragile and are distributed into five principal bundles; the lower bundle is salient and placed without symmetry on the proximal border of the opesium.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.24 \text{ mm.} \\ lo=0.16\text{–}0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.30 \text{ mm.} \\ lz=0.24\text{–}0.30 \text{ mm.} \end{array}\right.$

Affinities.—The walls of this species are very fragile and are easily worn; the zooecia are then scarcely distinct, and certain zooecia bear tubercles at the angles.

This species is quite close to *Hemiseptella denticulata* Smitt, 1872, which also presents tubercles. It differs from it in its less deep cryptocyst and in the inconstancy of the tubercles. However, we possess no specimen of this species and our comparisons are made only from the figures. It differs from *Hemiseptella granulata* in the absence of granules on the mural rim and in its subtrifoliate opesium.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare).

Cotypes.—Cat. No. 68496, U.S.N.M.

Genus CUPULARIA Lamouroux, 1821.

1821. *Cupularia* LAMOUROUX, Exposition methodique des genres de l'ordre des Polypiers, p. 44.

The zoarium is a more or less expanded cup; it is provided with a special hydrostatic system accompanied by vibracula. The opesium is fringed with spinous processes which are flat, free, or joined together; the two distal processes are symmetrically placed and serve as support to the opercular valve. The two distal opesiules are always rounded. No ovicell. Vestibular arch present.

Genotype.—*Cupularia umbellata* Defrance, 1823. Range: Miocene-Recent.

Affinities.—The genus *Cupularia* is identical in its frontal with the genus *Hemiseptella* Levinsen, 1909. It differs from it in its cup-shaped zoarial form, in the presence of vibracula, the flat form of the spinous processes, and in the union of the latter.

Cupularia lives like *Lunularia*, of which we have explained the hydrostatic zoarial mechanism. (See North American Early Tertiary Bryozoa, p. 238). The cellular or external face is the inferior face; the noncellular or internal face is the superior face. The ancestrular zooecia are often calcified, indeed only the opercular valve may be visible there; these are the hydrostatic zooecia (aborted of D'Orbigny); they are never radicular as in the genus *Lunularia*. The larvae probably develop in an oral sac, as in the genus *Diplodidymia* Ruess, 1869.

The union of the spines is not a generic character. In fact it may be accidental (as in *Cupularia denticulata*), partial (*C. reussiana*), almost complete (*C. umbellata*). This union of the spinous processes forms a cryptocyst.

Smitt, 1872, recognized that this genus ought to be classed in the Microporidae. This was correct, as the opesiules or opesiular slits are always clearly visible. In order to show the character of the genus in more detail we have introduced descriptions of a few European species.

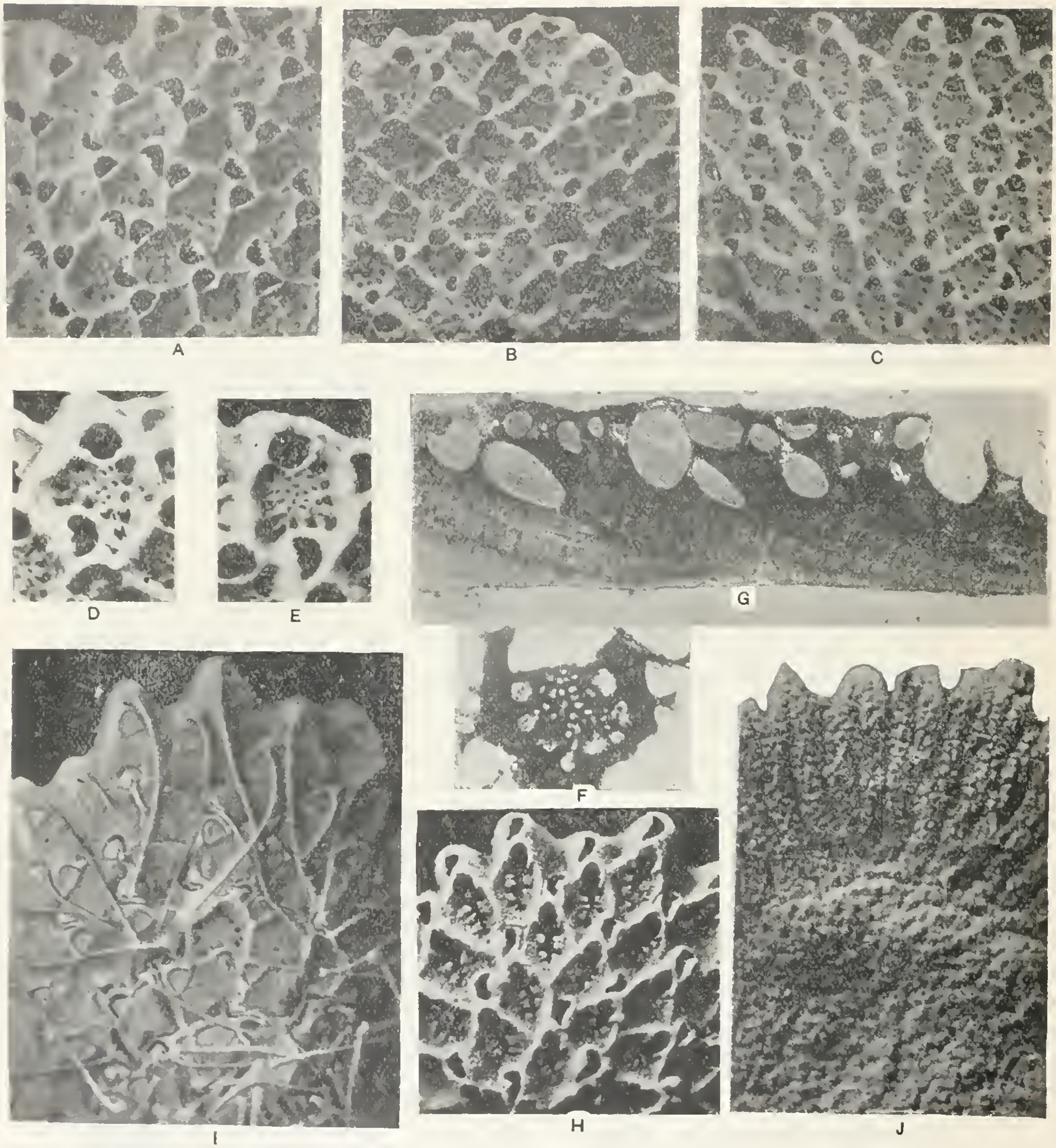


Fig. 13. Genus *Cupularia* Lamouroux, 1921.

A-F. *Cupularia umbellata* Defrance, 1923.

A. Zooecia. × 25 of specimen dredged in the Mediterranean at Oran (Algeria). B. An example, × 25, with small, wide zooecia. C. Specimen with small, long zooecia, × 25. D, E. Zooecia enlarged × 50 showing the formation of the cryptocyst by the partial union of spinous processes. F. Tangential thin section of the frontal, × 75, showing the successive ramifications of the lateral spinons processes.

G. Longitudinal thin section. × 75, showing the successive zones of calcification.

J. Internal face (superior) of a zoarium, × 25. (B-G, J) Burdigalian of Merignac, Gironde France.

H, I. *Cupularia multispinata*, new species.

H. Portion of a zoarium deprived of its ectocyst, × 25. I. Zoarium × 25,, provided with its ectocyst, and its vibracula. Mediterranean at Oran (Algeria).

CUPULARIA HAIDINGERI Reuss, 1847.

Plate 1, figs. 13–17.

1847. *Lunulites haidingeri* Reuss, Die fossilen Polyparien des Wiener Tertiarbeckens, Haidinger's naturwissenschaftliche Abhandlungen, vol. 2, p. 58, pl. 7, fig. 26, 27.
1859. *Cupularia denticulata* Busk, Monograph Fossil Polyzoa of the Crag, Publications Paleontolographical Society, p. 85, pl. 13, fig. 1.
1877. *Cupularia haidingeri* Manzoni, I Briozoi fossili del Miocene d'Austria ed Ungheria, parte 2, Denkschriften der k. Akademie der Wissenschaften, Wien, vol. 37, p. 73, pl. 16, fig. 54.
1880. *Cupularia haidingeri* Seguenza, La formazioni tergiarie nella Provincia di Reggio (Calabria), Reale Accademia dei Lincei, Memorie della Classe di Scienze Fisiche, Matematiche e Naturali, ser. 3, vol. 6, pp. 84, 131.

Measurements.—Large zooecia $\begin{cases} Lz=0.60 \text{ mm.} \\ lz=0.36\text{–}0.40 \text{ mm.} \end{cases}$

Variations.—The place of the opercular valve is clearly indicated by a distal arch limited by two symmetrical apophyses or condyles. The spinous processes are flat, often very wide, claviform or finely denticulated; their number is five (which includes the two oral apophyses). Their form is inconstant, and we figure some interesting variations. Our determination of the species has been verified by specimens from Porzteich, Austria-Hungary. The internal face bears radial, bifurcated, and tuberous ribs.

Affinities.—This species differs from *Cupuladria canariensis*, Busk, 1859, in the presence of spinous processes and in the absence of the large pores of the internal face. It differs from *Cupularia denticulata* Conrad, 1841, in its larger and flatter zoarial form, its larger zooecia, and in the larger tuberosities of the internal face.

Geological distribution.—Helvetian of Italy (Seguenza); Tortonian of Italy (Seguenza), of Austria-Hungary (Reuss); Redonnian of France (Canu); Plaisancian of England (Busk).

CUPULARIA DOMA D'Orbigny, 1851.

Plate 1, fig. 18; plate 15, figs. 1–5.

1851. *Discoflustrellaria doma* D'Orbigny, Paléontologie francaise, Terrain Crétacé, vol. 5, Bryozoaires, p. 561.
1859. *Cupularia johnsoni* Busk, Zoophytology: On some Madeiran Polyzoa, Quarterly Journal Microscopical Science, vol. 7, p. 67, pl. 23, figs. 1–6.
1872. *Cupularia doma* Smitt, Floridan Bryozoa, collected by Count Pourtales, Kongl. Svenska, Vetenskaps-Akademiens Handlingar, pt. 2, vol. 11, No. 4, p. 15, pl. 3, figs. 81–84 (not Busk, 1859).
1877. *Cupularia reussiana* Manzoni, Bryozoaires du pliocene superieur de l'Ile de Rhodes, Memoires de la Société Géologique de France, ser. 3, vol. 1, p. 67.
1909. *Cupularia johnsoni* Norman, Polyzoa of Madeira and neighboring islands, Journal Linnean Society London, Zoology, vol. 30, p. 290, pl. 38, figs. 1–6.

Variations.—The spinous processes are flat or acuminate; there are even some which are spatulate and some fimbriated. The two superior ones form two symmetrical condyles serving as pivot to the opercular valve. The others are three in number; they are dissymmetrical, irregularly placed, without definite and constant form, never joined. The cryptocyst is more or less developed and its presence considerably modifies the aspect of the opesium. The internal face bears hydrostatic tuberosities (as usual), very inconstant in their size; they are generally very large, but may disappear almost totally. The zoarium is conical, higher than wide. The two opesiules are formed by two rounded indentations symmetrically placed below the condyles.

Affinities.—Smitt has confused this species with *Cupularia reussiana* Manzoni, 1869. He saw D'Orbigny's type in Paris. Manzoni and Norman have adopted the same synonymy. For all these authors the essential character was the absence of a complete calcareous pivot for the opercular valve, as in *Cupularia umbellata* Defrance, 1823. In reality all the *denticulata* group possess this character and the species are differentiated from each other not only in their zoarial form but also by the number and nature of their spinous processes and in the form of their hydrostatic tubercles.

This species differs from *Cupularia multispinata*, new species, in the presence of three (and not five) spines, and in the conical form of the zoarium. It differs from *Cupularia denticulata* Conrad, 1841, which has the same number of spinous processes, in the more conical form of the zoarium, and in the presence of large hydrostatic tuberosities on the internal face. It differs from *Cupularia reussiana* Manzoni, 1869, in the more conical form of the zoarium and in its spinous processes never joined together.

Occurrence.—Sicilian of Rhodes (Manzoni). Miocene (Duplin marl): Wilmington, North Carolina.

Habitat.—Mediterranean: Shores of Algeria (72 meters), Oran (81–103 meters). Atlantic: Madeira (64–113 meters). Gulf of Mexico: Florida (Smitt).

CUPULARIA MULTISPINATA, new species.

Description.—The zoarium is discoidal, thin, very convex, much less high than wide. The zooecia are elongated, distinct, hexagonal; the mural rim is thin, little salient; the cryptocyst is more or less developed laterally. The opesium is ornamented by at least five flat spinous processes nonsymmetrical, rather wide, finely denticulated. Two symmetric salient condyles limit the apertura. A vestibular arch is present. The vibracula are large and auriform.

Measurements.—Large zooecia $\begin{cases} Lz = 0.48 \text{ mm.} \\ lz = 0.32 \text{ mm.} \end{cases}$

Affinities.—This species bears the most numerous spinous processes and this character is amply sufficient to differentiate it from *Cupularia reussiana* Manzoni, 1869; *C. doma* D'Orbigny, 1851; and from *C. denticulata* Conrad, 1841. The hydrostatic zooecia have their cryptocyst entirely calcified.

Habitat.—Mediterranean: Gulf of Oran (105 meters).

CUPULARIA REUSSIANA Manzoni, 1869.

Plate 1, figs. 19–22.

1869. *Cupularia reussiana* MANZONI, Bryozoi Pliocenici Italiani, Sitzungsberichte der kaiserlichen Akademie der Wissenschaften, Wien, vol. 59, p. 27, pl. 2, fig. 19.

1895. *Cupularia reussiana* NEVIANI, Briozoi fossili della Farnesina e Monte Mario presso Roma, Palaeontographia Italica, vol. 1, p. 102 (sep. 26).

1895. *Cupularia reussiana* NEVIANI, Briozoi neozoici di alcune localita d'Italia, Bollettino della Societe Romana per gli Studi Zoologici, parte 1, vol. 4, p. 45 (sep. 7); parte 2, p. 243 (sep. 19); parte 5, vol. 7, p. 101 (sep. 4), p. 103 (sep. 6).

1900. *Cupularia reussiana* NEVIANI, Briozoi neogenici delle Calabrie, Paleontologia italica, vol. 6, p. 169 (55) (regional bibliography).

1900. *Cupularia reussiana* NEVIANI, Briozoi Terziari della Toscana, Bollettino Sociètá geologica italiana, vol. 19, p. 19 (sep.).

1913. *Cupularia reussiana* CANU, Contributions a l'Etude des Bryozoaires fossiles: IV. Pliocene d'Alger, Bulletin Société Géologique de France, ser. 4, vol. 13, p. 126.

1913. *Cupularia haidingeri* CANU, Bulletin Société Géologique de France, ser. 4, vol. 13, p. 128.

Historical.—Manzoni's figures of 1869 are exact, although the zoarium is much less conical and almost cupuliform. As the figure of the cellular face has served for the determination by Seguenza, Canu, and Neviani we can hold as exact the synonymy given, moreover partially verified by Canu.

Variations.—The apertural arch is constant; it forms with the two wide, lateral opesiular indentations a trifoliate opesium. The inferior spinous processes are partially united and separated at their base by three large pores which are perhaps secondary opesiules. This character is specific. The vestibular arch is very large; the internal face is covered with large tuberosities.

Affinities.—All the authors, on the authority of Smitt, have confused this species with *Cupularia doma* D'Orbigny, 1851, the examination of the zoarial form having been judged sufficient. It differs much from it in its cupuliform zoarium (and not very conical) and in the union of the spinous processes occasioning the formation of three large frontal pores.

This species differs from *Cupularia umbellata* Defrance, 1823, in the presence of three frontal pores only, and in its opesiules not separated from the apertura and reduced to the state of indentations.

Geological distribution.—Tortonian of Italy (Seguenza, Neviani); Zanclean of Italy (Seguenza); Plaisancian of Italy (Neviani); Astian of France and Italy (Canu); Sicilian of Italy (Waters, Seguenza).

This species has not yet been found in the Mediterranean dredgings carried out by Canu. Waters did mention it at Naples.

CUPULARIA DENTICULATA Conrad, 1841.

Plate 15, figs. 6–10.

1841. *Lunulites denticulata* CONRAD (in Hodge), Observations on the Secondary and Tertiary formations of the southern Atlantic States, American Journal Science and Arts, ser. 1, vol. 41, p. 348.

1845. *Lunulites denticulata* LONSDALE, Report on the Corals from the Tertiary formations of North America, Quarterly Journal Geological Society, London, vol. 1, p. 503.

1857. *Lunulites denticulata* TUOMEY and HOLMES, Pleiocene Fossils of South Carolina, p. 11, pl. 4, figs. 1–5.

1904. *Cupularia denticulata* ULRICH and BASSLER, Maryland Geological Survey, Miocene, p. 414, pl. 112, fig. 6.

Measurements.—Large zooecia $\begin{cases} Lz = 0.30\text{–}0.40 \text{ mm.} \\ lz = 0.20\text{–}0.24 \text{ mm.} \end{cases}$

Variations.—The hydrostatic zooecia are thin, calcified, probably deprived of polypide, garnished with a complete cryptocyst; their apertura is small and serves probably as passage for a more or less long bristle; they surmount the grain of sand on which the larva is fixed. The internal face is flat or curved; the radiating ribs are generally smooth, but small tuberosities are not rare. The two condyles are not always exactly symmetrical. The spinous processes are acuminate or flat, short, finely denticulated, numbering three or four; they are irregular and their position never symmetrical. The zoarium is rather variable. The small specimens are always wider than high. The large specimens are cupuliform but always very convex.

This species differs from *Cupularia haidingeri* Reuss, 1847 (= *C. denticulata* Busk, 1859), in the smaller micrometric measurements and in the absence of the large hydrostatic tuberosities of the internal face. It differs from *Cupularia reussiana* Manzoni, 1869, in its spinous processes never united. It differs from *Cupularia doma* D'Orbigny, 1851, which it most resembles in its large, thin, cupuliform zoarium and in the absence or attenuation of the large tuberosities of the internal face.

Occurrence.—Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina (type locality); Wilmington, and many other localities in North and South Carolina. Miocene (Choctowhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (common). Miocene (St. Mary's formation): St. Marys River, Maryland (rare). Miocene (Yorktown formation): Williamsburg, York River, and other localities in Virginia (rare). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (very common). Pliocene (Caloosahatchee marl): Monroe County, Florida (very common).

Plesiotypes.—Cat. Nos. 68497–68505, U.S.N.M.

CUPULARIA UMBELLATA Defrance, 1823.

Plate 2, figs. 15–19.

1823. *Lunulites umbellata* Defrance, Dictionnaire du Sciences Naturelles, vol. 27, p. 361.

1862. *Discoporella denticulata* Gabb and Horn, Monograph of the fossil Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy of Natural Sciences of Philadelphia, ser. 2, vol. 5, p. 142, pl. 20, fig. 25.

1872. *Cupularia umbellata* Smitt, Floridan Bryozoa, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, p. 14, pl. 3, figs. 75-80.

1889. *Cupularia umbellata* Jelly, A synonymic Catalogue of marine Bryozoa, p. 79 (general bibliography).

1895, 1900. *Cupularia umbellata* Neviani, Briozoi, neozoici di alcune localita d'Italia, Bollettino della Società Romana per gli Studi Zoologici, pt. 2, vol. 4, 1895, pp. 237, 243; pt. 4, vol. 7, 1898, p. 38; pt. 5, vol. 8, 1898, pp. 98, 100, 106; pt. 6, (2), vol. 1, p. 60.

1896. *Cupularia umbellata* Neviani, Briozoi fossili della Farnesina, Palaeontographia Italica, vol. 1, p. 101 (sep. 25).

1900. *Cupularia umbellata* Neviani, Bryozoi, terziari et posterziari della Toscana, Bolletino della Società geologica Italiana, vol. 19, p. 362 (sep. 18).

1900. *Cupularia umbellata* Neviani, Brioizoi neogenici della Calabrie. Palaeontographia Italica vol. 6, p. 168 (regional bibliography).

1908. *Cupularia umbellata* Canu, Iconographie des Bryozoaires fossiles de l'Argentine, Anales del Museo Nacional de Buenos Aires, vol. 17, p. 274, pl. 5, figs. 4, 5 (bibliography).

1909. *Cupularia umbellata* Canu, Bryozoaires fossiles du Sud-Ouest de la France, Bulletin de la Société Geologique de France, ser. 4, vol. 9, pp. 448, 454, pl. 16, figs. 16, 17 (regional bibliography).

1909. *Cupularia lowei* Norman, On the Polyzoa of Madeira, Journal Linnean Society, vol. 30, p. 290, pl. 37, figs. 7–12.

1913. *Cupularia umbellata* Canu, Etude comparée des Bryozoaires Helvetiens de l'Egypte avec les Bryozoaires vivants de la Mediterranée et de la Mer Rouge: Mémoire de l'Institut Egyptien, vol. 6, fasc. 3, p. 205.

1913. *Cupularia umbellata* Canu, Contributions à l'étude des Bryozoaires fossiles, Bulletin Société Géologique de France, ser. 4, vol. 13, pp. 125, 127.

1914. *Cupularia lowei* Osburn, The Bryozoa of the Tortugas Islands, Florida, Publication No. 182 of the Carnegie Institution of Washington, p. 194.

1916. *Cupularia umbellata* Canu, Bryozoaries fossiles du Sud-Ouest de la France, Bulletin Société Géologique de France, ser. 4, vol. 15, p. 322.

1919. *Cupularia umbellata* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications Carnegie Institution of Washington, No. 291, p. 85, pl. 1, figs. 5–7; pl. 2, figs. 17–21.

We are ignorant as to why Norman, who is a great lover of archaic names, has not preserved the name of Defrance. The figures published by this author and by D'Orbigny are excellent and leave no doubt as to the identity of the species. The fossils which are identified as above are rather well preserved and their determination is easy. The pores of the hydrostatic zooecia are not radicular.

Variations.—In this species the two oral condyles are developed and united in a manner to produce a pivot serving as a support to the hinge of the opercular valve. The spinous processes number from seven to eight; they are united on the greater part of their length and form a false cryptocyst perforated with very irregular holes; at their base there is no union and they thus limit a certain number of opesiules arranged all over the zooecium.

As Smitt thought in 1872, this species differs only from the species of the *denticulata* group in a greater calcification and in a more complete development of the spinous processes. In spite of its superficial appearance it therefore belongs to the same genus.

The specimens from Santo Domingo, where the species had been noted by Busk in 1859, are quite vigorous. They represent a variation that is remarkable in the size of the zooecia and in the aspect of the inner side. The latter does not show the usual tuberose ribs and the tuberosities are equally distributed on the zoarial surface. The ancestrula is not always visible; it is often covered over by a normal zooecium or replaced by a special region in which the zooecia are arranged in contrary order.

Measurement.—Opesia $\begin{cases} ho = 0.12 \text{ mm.} \\ lo = 0.16 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.44 - 0.50 \text{ mm.} \\ lz = 0.34 \text{ mm.} \end{cases}$

Occurrence.—Lower Miocene (Gatun formation): Banana River, Costa Rica (common). Lower Miocene: Chipola River, Calhoun County, and Shoal River, Walton County, Florida (common). Lower Miocene: (Oak Grove); Oak Grove, Yellow River, Florida (common). Lower Miocene (Bowden horizon): Bowden, Jamaica: Cercado de Mao, Rio Cana, and Rio Gurabo, Santo Domingo (common). Miocene (Duplin marl): Wilmington and other localities in North Carolina and South Carolina (common). Pliocene of South Carolina and Florida.

This species is almost always associated with *Cupuladria canariensis* Busk, 1859. Like the latter it commences in the Lower Miocene and continues through the latter Miocene and Pliocene of the United States.

Geological distribution.—Aquitanian of Italy (Seguenza, Neviani), of Bordeaux (Canu); Burdigalian of Italy (Seguenza, Canu), of Bordeaux (Canu); Helvetian of Egypt, Bordeaux, and Touraine; Tortonian of Provence (Canu), of Italy (Seguenza); Plaisancian of England (Busk), of Italy (Manzoni); Astian of Italy (Neviani, Canu), of Provence (Canu); Sicilian of Italy (Neviani); Quaternary of Italy (Seguenza), of Argentina (Canu).

Habitat.—Mediterranean; Atlantic, Canary Islands, and Florida. It is common in the Gulf of Gascony in the Miocene, but it has now disappeared from this region. The species has been dredged at a depth of 11 to 48 meters in America and from 81 to 113 meters at Madeira.

Plesiotypes.—Cat. Nos. 68506–68511, U.S.N.M.

CUPULARIA ROBERTSONIAE, new species.

Plate 34, figs. 5–7.

1908. *Cupularia canariensis* Robertson, The incrusting Cheilostomatous Bryozoa of the West Coast of North America, University of California Publications 11, Zoology, vol. 4, no. 5, p. 314, pl. 24, figs. 90, 91.

Description.—The zoarium is discoid, little convex. The zooecia are distinct, much elongated, lozenge shaped; their mural rim is thin, sharp. The cryptocyst is deep, flat, perforated in the middle by some irregular pores and laterally by seven large opesiules; the opesium is ogival, transverse, with a proximal concave border. The vibraculum is large, salient, auriform and provided with a very large opesium.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.10 \text{ mm.} \\ la\ =0.15 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.60 \text{ mm.} \\ lz\ =0.30\text{–}0.35 \text{ mm.} \end{array}\right.$

Affinities.—The few fossil fragments in our collections appear to agree with *Cupularia canariensis* Robertson, 1908, dredged in the Pacific off the shores of California. This species is very close to *Cupularia umbellata* Defrance, 1828; but differs in its larger and less numerous opesiules and in its smaller zoarium. It differs from *Cupularia reussiana* Manzoni, 1869, in its more numerous and smaller opesiules and in its flatter zoarium.

Occurrence.—Pleistocene: Santa Monica (Long Wharf Canyon), California (rare).

Habitat.—Pacific, off San Pedro (6 meters) and island of Santa Catalina, California.

Cotypes.—Cat. No. 68512, U.S.N.M.

Genus CALPENSIA Jullien, 1888.

1888. *Calpensia* Jullien, Mission scientifique du Cap Horn, VI, Zoologie, Bryozoaires, p. 78.

The cryptocyst is entirely developed; it bears two distinct secondary opesia [opesiules]. The operculum is semilunar. (After Jullien.)

The opesiular outgrowths join the lateral walls, forming a closed hollow on each side. A simple, feebly chitinized operculum. Numerous pores, but no spines. No ovicell. No avicularia. The distal wall consists of a basal horizontal and a frontal ascending part, the former being furnished with a narrow transverse group of small uniporous rosette plates [=septulae]. The distal half of each distal wall with a single multiporous plate. (Levinsen.)

Genotype.—*Calpensia* (*Flustra*) *impressa* Moll, 1803. Range: Auversian, Recent.

CALPENSIA IMPRESSA Moll, 1803.

Plate 1, fig. 4.

1803. *Eschara impressa* MOLL, Die Seerinde aus der Ordnung der Pflanzenthiere, Wien, p. 57, pl. 11, fig. 9.
1847. *Eschara nobilis* MICHELIN, Iconographie zoophytologique, p. 329, pl. 79, fig. 1.
1854. *Membranipora calpensis* BUSK, Catalogue of the Marine Polyzoa, British Museum, Cheilostomata, pt. 2, p. 60, pl. 104, fig. 5, 6.
1879. *Micropora impressa* WATERS, On the Bryozoa of the Bay of Naples, Annals Magazine Natural History, ser. 5, vol. 3, p. 1230.
1902. *Micropora impressa* CALVET, Bryozoaires marins des cotes de Corse, Travaux de l'Institut de Zoologie de l'Universite de Montpellier, ser. 2, mem. 12, p. 17.
1910. *Micropora impressa* CANU, Bryozoairs fossiles de terrains du Sud. Ouest de la France, Bulletin Société Géologique de France, ser. 4, vol. 10, p. 844, pl. 16, fig. 6 (variety).
1911. *Micropora impressa* MME. GUERIN-GANIVET, Contribution a l'etude des Bryozoaires des cotes Armoricaines, I, Travaux scientifique du Laboratoire de Concarneau, vol. 3, p. 5, pl. 1
1919. *Calpensia impressa* CANU and BASSLER, Geology and Palentology of the West Indies, Bryozoa, Publication of the Carnegie Institution of Washington, No. 291, p. 84, pl. 1, fig. 11.

The discovery of this species in America was a great surprise, since it has heretofore been noted only in the Mediterranean area, where its zoaria occur in great abundance, especially along the African coast. Our determination is nevertheless an exact one, as we possess so many specimens for comparison that we should not be mistaken.

The bibliography of this species given by Pergens, Jelly, and Waters is incorrect, for they have confounded many distinct species. Canu noted five of them in 1911. In spite of its antiquity there are no unquestioned references to the species other than those we have given above.

The zoarium may be incrusting or Eschara-like. We have never observed an ovicell—indeed, the species may have none.

Occurrence.—Oligocene (Antigua formation): Carlisle marl pit, Antigua, Leeward Islands (rare).

Geological distribution.—Helvetian of Brittany, France (Michelin); Sahelian of Oran (Canu collection); Sicilian of Italy (Neviani).

Habitat.—Mediterranean: Gibraltar, Corsica, Tuscany, Naples, Adriatic, Aegean Sea, Tunis, Algeria, Morocco; Atlantic off Brittany. It abounds at a depth of 25–30 meters and is very common at the depths of 75–100 meters.

Plesiotype.—Cat. No. 68513, U.S.N.M.

Genus VERMINARIA Jullien, 1888.

1888. *Verminaria* JULLIEN, Mission scientifique du Cap Horn. VI, Zoologie, Bryozoaires, p. 78.

The cryptocyst bears many opesiules on each side. The opesium is subterminal. (After Jullien.)

Genotype.—*Verminaria* (*Membranipora*) *oblonga* Busk, 1859. Pliocene.

Genus MICROPORINA Levinsen, 1909.

1909. *Microporina* LEVINSEN, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 162.

The two opesiulae, which, however, are sometimes filled up, appear as simple perforations. Numerous pores. No ovicell, but avicularia with crossbar occur.

Each distal wall and the distal half of each lateral wall with a row (6–8) of one or two pored rosette plates [septulae]. A longitudinal series of parietal muscles is placed on each side between the cryptocyst and the covering membrane.

Genotype.—*Microporina* (*Cellaria*) *borealis* Busk and *Microporina* (*Micropora*) *elongata* Hincks, 1880. Range: Campanian, Recent.

Homalostega amphora Marsson, 1887, from the Campanian of Rügen, also belongs to this genus.

Genus CORYNOSTYLUS Canu and Bassler, 1919.

1919. *Corynostylus* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publication of the Carnegie Institution of Washington, No. 291, p. 86.

No ovicell. The opercular valve articulates on two condyles. The zooecia are club shaped and provided with a gymnocyst. The zoarium is articulated.

Genotype.—*Corynostylus labiatus* Canu and Bassler, 1919. Miocene.

This genus has no recent equivalent but its structure is easy to interpret. The two condyles serve as a hinge for the strongly chitinized opercular valve. The lower part of the opesium placed below served evidently as passage for the opesiular fibers attached to the ectocyst. The deep cavity of the cryptocyst served as a hydrostatic apparatus for the entrance and exit of the polypide. Like most of the articulated genera, the zoarium in this one probably was fastened on large mobile algae.

CORYNOSTYLUS LABIATUS Canu and Bassler, 1919.

Plate 2, figs. 11–13.

1919. *Corynostylus labiatus* Canu and Bassler, Geology and Paleontology of the West Indies. Bryozoa, Publications Carnegie Institution of Washington, No. 291, p. 87, pl. 2, figs. 11–13.

Description.—The zoarium is articulated and formed of long regular segments. The segments are compressed, bilamellar, formed of three longitudinal rows of zooecia on each side. The zooecia are elongate, oval, distinct, rounded in front, narrowed behind and are provided with a convex gymnocyst with large pores; the mural rim is thick, regular, granular. The opesium is elongate, oval, provided with a proximal, salient lip placed between two rounded opesiular indentations. The two condyles are quite salient. The cryptocyst is deep and smooth.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.12\text{ mm.}\\ lo=0.10\text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{ mm.}\\ lz=0.26-0.28\text{ mm.}\end{array}\right.$

Affinities.—The first zooecium of each segment is radicular; it gives rise to three polypidian zooecia.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (common).

Holotype.—Cat. No. 68514, U.S.N.M.

CORYNOSTYLUS ELLIPTICUS Canu and Bassler, 1919.

Plate 2, figs. 8–10.

1919. *Corynostylus ellipticus* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, No. 291, p. 87, pl. 2, figs. 8–10.

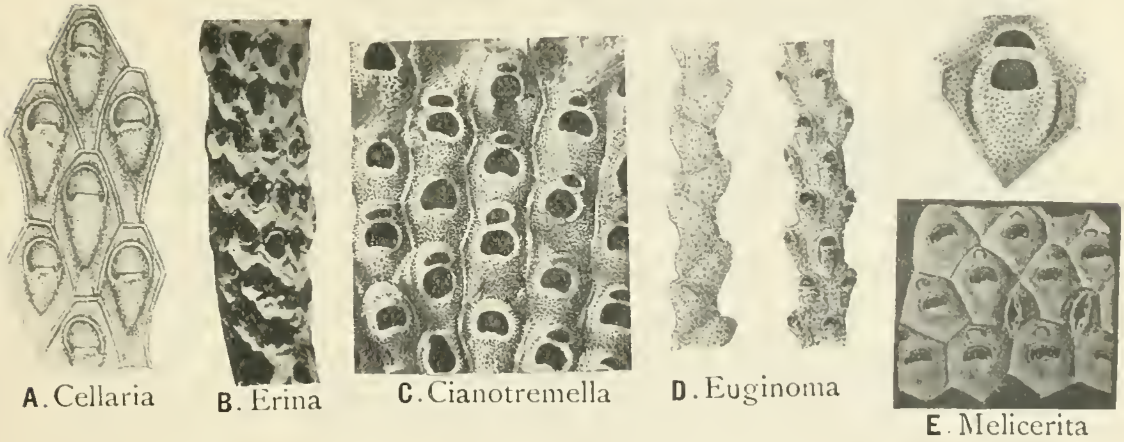
Description.—The zoarium is articulated. The segments are formed of two longitudinal rows of zooecia placed only on one side of the zoarium. The zooecia are distinct, club shaped, with long, convex, and porous gymnocyst. The mural rim is thin and granular. The opesium is elliptical, elongate, surrounded by a salient rim; the two condyles are large and median. The cryptocyst is deep, smooth, and small.

Measurements.—Opesia $\begin{cases} ho=0.14 \text{ mm.} \\ lo=0.10 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz=0.50 \text{ mm.} \\ lz=0.20-0.22 \text{ mm.} \end{cases}$

Affinities.—This species differs from *Corynostylus labiatus* in its unilamellar segments with only two zooecial rows and in the absence of a salient lip proximal to the opesium. Only the fragments figured have been found; they are extremely fragile.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare).

Cotypes.—Cat. No. 68515, U.S.N.M.



A. Cellaria **B**. Erina **C**. Cianotremella **D**. Euginoma **E**. Melicerita

Fig. 14.—Genera of the family Cellariidae Hincks, 1880.

A. *Cellaria* Authors. *C. sinuosa* Hassall, 1841. × 50. Recent. (After Hincks, 1880.)

B. *Erina* Canu 1908. *E. patagonica* Canu, 1908. Cretaceous. (After Canu, 1908.)

C. *Cianotremella* Canu, 1911. *C. gigantea* Canu, 1911. Cretaceous. (After Canu, 1911.)

D. *Euginoma* Jullien, 1882. *E. vermiformis* Jullien, 1882. × 21. Recent. (After Jullien, 1882. Upper right-hand figure, zooecium enlarged, showing ovicell.

E. *Melicerita* Milne-Edwards, 1838. *M. charlesworthi* Busk, 1859. × 25. Pliocene. (After Busk, 1859.)

Family CELLARIIDAE Hincks, 1880.

Genus CELLARIA Authors.

(For description see Bulletin 106, U. S. National Museum, p. 272.)

CELLARIA FISSURIFERA, new species.

Plate 34, figs. 15–18.

Description.—The segments are cylindrical, slender at the base. The zooecia are rhomboidal, distinct, adjacent or partially separated by a very deep furrow; the mural rim is thin, salient, sharp, and ornamented with small tuberosities; the cryptocyst is smooth, deep, scarcely convex. The apertura is semilunar, surrounded by a thin and salient peristome; the proximal lip is very convex and bears two very small lateral denticles. The orifice of the ovicell, which is endotoichal, is small. The zooecia bearing branches are narrow, with an elliptical elongate orifice. The interzooecial avicularium is elliptical or subrectangular; its opesium is irregular.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.15 \text{ mm.} \\ la=0.17 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.85 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{array}\right.$

Affinities.—In the determination of *Cellaria*, one must take into consideration the zooecia bearing branches which are somewhat equivalent to the "basis ramae" of *Crisia*. Their orifice serves as a place for a horny cylindrical joint.

This species differs from *Cellaria mandibulata* Hincks, figured by Miss Robertson, 1905, in the small round orifice of the ovicell and in the form and size of its zooecia bearing branches, which are narrow and provided with an elongate orifice and not transverse, and in the absence of large avicularian zooecia.

Occurrence.—Pleistocene: Santa Monica, California (rare).

Cotypes.—Cat. No. 68516, U.S.N.M.

CELLARIA MANDIBULATA Hincks, 1882.

Plate 34, figs. 11–14.

1882. *Cellaria mandibulata* Hincks, Polyzoa of the Queen Charlotte Islands, Annals and Magazine Natural History, ser. 5, vol. 10, p. 462; 1884, ser. 5, vol. 13, p. 203, p. 9, fig. 7.

1905. *Cellaria mandibulata* Robertson, Nonincrusting Cheilostomatous Bryozoa of the West Coast of North America, University of California Publications, Zoology, vol. 4, no. 5, p. 288, pl. 15, figs. 87, 89; pl. 16, fig. 103.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.07 \text{ mm} \\ la=0.14 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.60 \text{ mm} \\ lz=0.39 \text{ mm.} \end{array}\right.$

Variations.—The orifice of the ovicell is quite variable; sometimes it is an ellipse, elongate and narrow; more often it is an orbicular orifice. The two forms may exist on the same segment. The avicularian zooecia are enormous and comparable to those which are observed on the recent specimens. The reader will comprehend their function by studying Miss Robertson's figure 88. The orifice of the zooecia bearing branches is round, surrounded by a salient peristome.

Occurrence.—Pleistocene: Los Angeles, California (very common).

Habitat.—Pacific Ocean off San Pedro and San Diego, California.

Plesiotypes.—Cat. No. 68517, U.S.N.M.

CELLARIA DIFFUSA Robertson, 1905.

Plate 34, figs. 19, 20.

1905. *Cellaria diffusa* Robertson, Nonincrusting Cheilostomatous Bryozoa of the West Coast of North America, University of California Publications, Zoology, vol. 4, no. 5, p. 289, pl. 15, fig. 90; pl. 16, fig. 104.

We have found very few fragments of this large and superb species. We have observed the same proximal tongue in the orifice of the ovicell, the same proximal convexity of the apertura, and the same rectangular interzooecial avicularium. Our micrometric measurements would be slightly larger if the scale of Miss Robertson be exact.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon) and Los Angeles, California (rare).

Habitat.—Pacific Ocean off California.

Plesiotype.—Cat. No. 68518, U.S.N.M.

Genus **ERINA** Canu, 1908.

1908. *Erina* Canu, Iconographie des Bryozoaires fossiles de l'Argentine, pt. 1, Anales del Museo Nacional de Buenos Aires, vol. 17, p. 273.

The opesium is round, without oral denticles.

Genotype.—Erina patagonica Canu, 1908. Patagonian.

Genus **MELICERITA** Milne-Edwards, 1836.

1836. *Melicerita* Milne-Edwards, Recherches anatomiques sur les Eschares, Annales des Sciences Naturelles, Zoologie, ser. 2, vol. 6, p. 26.

The zoarium is bilamellar and not articulated.

Genotype.—Melicerita charlesworthi Milne-Edwards, 1836. Astian.

Genus **EUGINOMA** Jullien, 1882.

1882. *Euginoma* Jullien, Dragages du *Travailleur:* Bryozoaires, Bulletin Société Zoologique de France, vol. 7, p. 520.

The zooecia are all turned forward and arranged in longitudinal rows; they are hexagonal, limited by a suture in relief; the orifice is semicircular, deprived of spines; the ovicell is formed by the raising of the wall of two zooecia superior to that which bears it; it is divided into two halves by the sutural line of these zooecia; its opening, like a policeman's helmet, is entirely above and in front of the orifice. Dorsal face of the zoarium is divided into trapezoidal areas which are the dorsal faces of two zooecia. (After Jullien.)

Genotype.—Euginoma vermiformis Jullien, 1882. Recent.

THE COSTULAE.

Family CRIBRILINIDAE Hincks, 1880.

Genus **CRIBRILINA** Gray, 1848.

(For description see Bulletin 106, U. S. National Museum, p. 290.)

CRIBRILINA PUNCTATA Hassall, 1841.

Plate 15, fig. 11.

1841. *Lepralia punctata* Hassall. Supplement to Catalogue of Irish Zoophytes, Annals and Magazine Natural History, vol. 7, p. 368, pl. 9, fig. 7.
1889. *Cribrilina punctata* Jelly, A Synonymic Catalogue of the Recent Marine Bryozoa, p. 67 (synonymy).
1901. *Cribrilina* (*Arachnopusia*) *punctata* Neviani, Briozoi neogenici della Calabrie, Paleontographia Italica, vol. 6, p. 174 (local bibliography).
1904. *Lepralia marylandica* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 425, pl. 117, fig. 2.
1905. *Cribrilina* (*Arachnopusia*) *punctata* Neviani, Briozoi fossili di Carrubare (Calabria), Bollettino Societa Geologica Italiana, vol. 23, p. 523.
1907. *Cribrilina punctata* Calvet, Bryozoaires, Expedition scientifique du *Travailleur* et du *Talisman*, p. 398 (bibliography).
1912. *Cribrilina punctata* Osburn, The Bryozoa of the Woods Hole Region, Bulletin Bureau Fisheries, vol. 30, 1910, p. 232, pl. 24, fig. 41 (bibliography).

This species lives mainly in the temperate and frigid regions and does not approach the Tropics. Its presence in the Miocene at Cove Point, Maryland, where it was described as *Lepralia marylandica* by Ulrich and Bassler, is very remarkable and would indicate the existence of a very cold boreal current.

Occurrence.—Miocene (St. Mary's formation): Cove Point, Maryland (rare).

Geological distribution.—Pliocene and Quaternary of Austria-Hungary (Busk, Bell) and of Italy (Seguenza).

Habitat.—Arctic Ocean: Jean Mayen (140–180 meters), Franz Joseph Land (210 meters); Sea of Kara; North Sea; Norway; Germany; Denmark (9–25 meters). Eastern Atlantic off England in the English Channel, in the Gulf of Gascony. Mediterranean (57–77 meters) and Adriatic. Madeira Islands. Western Atlantic from the St. Laurence to the Woods Hole Region.

Plesiotype.—Cat. No. 68519, U.S.N.M. (Holotype of *Lepralia marylandica* Ulrich and Bassler.)

CRIBRILINA LIGULATA, new species.

Plate 15, fig. 14.

Description.—The zoarium is encrusting a *Pecten*. The zooecia are distinct, separated by a deep furrow, elongated, regularly elliptical; the frontal is convex and bears 15 narrow, little salient costules; the lacunae are rectangular and larger on the margin than on the median zooecial axis. The apertura is large, tranverse, semilunar but with a concave proximal border; the peristome is wide, smooth, little salient; it bears four spines which can be transformed into two or three tongues by coalescence. The ancestrula is membraniporoid.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.10\text{ mm.}\\ la=0.12\text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{ mm.}\\ lz=0.30\text{–}0.32\text{ mm.}\end{array}\right.$

Affinities.—In its exterior aspect this species much resembles *Lepralia manzonii* Reuss, 1874, from the Tortonian of Austria-Hungary, but it differs in the presence of its liguliform spines. Normally there are only four large spines, but they become thickened easily and joined together to form two or three very salient tonguelike plates.

Occurrence.—Miocene (Calvert formation): 1 mile south of Parkers Creek. Calvert County, Maryland (very rare).

Holotype.—Cat. No. 68520, U.S.N.M.

CRIBRILINA CUSPIDATA, new species.

Plate 15, fig. 15.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, large, elongate; the frontal is very convex; it is surrounded by a line of small lacunae and ornamented with 5 or 6 large lacunae in the form of a crescent. The lumen is not visible. The apertura is semilunar; the anter is very large and the poster is concave. The ovicell is hyperstomial. Between the zooecia are large triangular avicularia in the form of the *head of a lance;* the beak is rounded and turned toward the top.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.17\text{ mm.}\\ la=0.20\text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} \mathrm{Lz}=0.85\text{ mm.}\\ lz=0.35-0.50\text{ mm.}\end{array}\right.$

Affinities.—This species is very little distinct from *Escharipora mucronata* Smitt, 1872, formerly dredged in the waters off Florida. It is distinguished from it in its larger and less salient mucro and in having more than three lacunae on the frontal.

The species of Smitt has not yet been rediscovered; we are ignorant, therefore, of its variations. It is hardly probable that the frontal pores would always be so constant as they are drawn on Smitt's figures, but as we are not able to judge the nature of the variations we are obliged to create a new species which will become perhaps in the future simply a variety. Only the figured specimen has been found.

Occurrence.—Miocene: Santiago, Cuba (very rare).

Holotype.—Cat. No. 68521, U.S.N.M.

Genus **PUELLINA** Jullien, 1886.

(For description see Bulletin 106, U. S. National Museum, p. 293.)

PUELLINA HERRMANNI Gabb and Horn, 1862.

Plate 35, figs. 2, 3.

1862. *Repteschareila herrmanni* Gabb and Horn, Monograph Fossil Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy of Natural Sciences, Philadelphia, ser. 2, vol. 5, p. 137, pl. 19, fig. 20.

Description.—The zoarium incrusts shells. The zooecia are large, elongate, elliptical, distinct, separated by a furrow and little convex. The costules are wide, flat, numbering from eight to ten; the lacunae are small and increase in size from the talon toward the zooecial axis. The apertura is semilunar, transverse, with a rectilinear proximal border.

Measurements.—Apertura$\left\{\begin{array}{l} ha=0.10\text{ mm.}\\ la=0.20\text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.60\text{ mm.}\\ lz=0.40\text{ mm.}\end{array}\right.$

Affinities.—The trace of the five oral spines as figured by Gabb and Horn is sometimes visible. In its exterior aspect and the width of the costules, this species is similar to *Cribrilina reniformis* Ortmann, 1890, and it differs from it only in the micrometric measurements if the magnification indicated by this author is exact.

Occurrence.—Pleistocene: Santa Barbara, California (very rare).

Plesiotype.—Cat. No. 68522, U.S.N.M.

PUELLINA RADIATA forma SCRIPTA Reuss, 1847.

Plate 15, fig. 12; plate 35, fig. 1.

1847. *Cellepora scripta* Reuss, Die fossilen Polyparien des Wiener Tertiärbeckens, Haidinger's Naturwissenschaftliche Abhandlungen, vol. 2, p. 82, pl. 9, fig. 28.

Measurements.—Apertura$\left\{\begin{array}{l} ha=0.06\text{ mm.}\\ la=0.08\text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.46-0.50\text{ mm.}\\ lz=0.24-0.30\text{ mm.}\end{array}\right.$

Apertura of ovicelled zooecia$\left\{\begin{array}{l} ha=0.08\text{ mm.}\\ la=0.10\text{ mm.}\end{array}\right.$

Variations.—The variations figured by the authors are very great; they depend on the number of the costules and on their width and also on the size of the avicularia. The photographs of our specimens are quite similar to the figures of Reuss and Manzoni; but the dimensions are generally larger than in Eocene examples, all of them corresponding to specimens dredged in the Mediterranean.

The operculum closes the ovicell. The latter is often keeled. The apertura of the ovicelled zooecia is always larger. The number of costules is never greater than 12 to 14. There are always five spines.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (rare). Miocene (Yorktown formation): 1 mile west of Fort Nonsense, Gloucester County, Virginia (rare). Pleistocene: Santa Barbara, California (rare).

Plesiotype.—Cat. Nos. 68523–68525, U.S.N.M.

PUELLINA RADIATA forma RARECOSTA Reuss, 1847.

1847. *Cellepora rarecosta* Reuss, Die fossilen Polyparien des Wiener Tertiärbeckens, Haidinger's Naturwissenschaftliche Abhandlungen, vol. 11, p. 82, pl. 10, fig. 4.

This form is recognizable by the small number and prominence of the costules. It accompanies the typical form of the species at many recent and fossil localities.

Occurrence.—Pleistocene: Santa Monica, California (rare).

Plesiotypes.—Cat. No. 68526, U.S.N.M.

PUELLINA RADIATA CAROLINENSIS Gabb and Horn, 1862.

Plate 1, fig. 10.

1862. *Repteschanella carolinensis* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences Philadelphia, vol. 5, p. 136, pl. 19, fig. 18.

1919. *Puellina radiata carolinensis* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, No. 291, p. 90, pl. 1, fig. 12.

1920. *Puellina radiata carolinensis* Canu and Bassler, Mongraph North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 297, pl. 41, fig. 19.

This variety is characterized by its smooth peristome, without tuberosities, and by the small canal of the avicularium, which is larger than in the type.

In reality the spines have not disappeared; on the perfect specimens they are still visible, but they never have the size and importance of those which decorate the type. The zooecia are a little larger and have 16 costules.

Occurrence.—Jacksonian of South Carolina and Alabama; Vicksburgian of Alabama. Oligocene (Anguilla formation): Southwest side of Crocus Bay Bluff, 125 feet above sea level, Anguilla, Leeward Islands (rare). Oligocene (Antigua formation): Rifle Butts, Antigua, Leeward Islands (rare).

Plesiotype.—Cat. No. 68527, U.S.N.M.

PUELLINA INNOMINATA Couch, 1844.

Plate 15, fig. 13.

1844. *Lepralia innominata* Couch, Cornish Fauna, pt. 3, p. 114.

1900. *Cribrilina radiata*, var. *innominata* Neviani, Briozoi neogenici della Calabrie, Palaeontographia Italica, vol. 6, p. 171 (regional bibliography).

1905. *Cribrilina radiata*, var. *innominata* Neviani, Briozoi fossili di Carrubare, Bollettino della Societa Geologica Italiana, vol. 23, p. 523 (sep. 21).

1909. *Puellina innominata* Norman, The Polyzoa of Madeira, Journal Linnean Society London, Zoology, vol. 30, p. 291 (zoological bibliography).

Variations.—The genus *Puellina* as limited by Jullien, 1886, and Levinsen, 1909, does not appear to us as well characterized as it is based on the presence of papillae whose physiologic function is not very evident. The relationship of the operculum to the ovicell constitutes for us generic characters of a greater importance in the Costulae as in the other Cheilostomata. It is in this feature that the present species is quite different from *Puellina* (*Cribrilina*) *radiata*, for the ovicell is never closed by the operculum. According to our views of classification it will be necessary to form a new genus for this type.

On our specimen the suboral pore is often replaced by a tubercle. The costules are fine and the lacunae are arranged in concentric series.

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (very rare).

Geological distribution.—Helvetian of Italy (Seguenza); Astian of Italy (Seguenza); Sicilian of Italy (Seguenza, Neviani); Quaternary of Italy (Waters, Seguenza, DeStefani).

Habitat.—England, Mediterranean, Florida.

Plesiotype.—Cat. No. 68528, U.S.N.M.

PUELLINA CRASSILABIATA, new species.

Plate 29, fig. 7.

Description.—The zoarium incrusts oysters. The zooecia are elliptical, regular, very little elongated, distinct, convex, separated by a furrow; the radial costules number 12 and taper toward the center, they are garnished with three large lumen pores and separated by four lacunae of diminishing size. The aperture is semilunar; the peristome is salient, very thin, and bears three hollow spines; a thick transverse lip borders the proximal edge of the apertura, between the two small oral avicularia. The ovicell is large, globular, salient, punctured by small, scattered pores; it opens by a special orifice in front of the oral lip.

Measurements.—Apertura $\begin{cases} ha=0.12 \text{ mm.} \\ la=0.10 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz=0.50 \text{ mm.} \\ lz=0.35 \text{ mm.} \end{cases}$

Affinities.—The apertura of the ovicelled zooecia is wider and measures 0.12 mm. in width. The ovicell is not closed by the operculum and the passage of the eggs is protected by the wide oral mucro. This species does not belong, therefore, to the genus *Puellina,* since the two functions of the passage of the eggs and the escape of the larva operate in an absolutely different fashion than in *Puellina radiata* Moll, 1803. There are six dietellae.

In the presence of two small oral avicularia, it resembles the following species: It differs from *Puellina puncturata* Busk, 1859, in its elongate and nontransverse ovicell. It differs from *Puellina calomorpha* Reuss, 1866, in its apertura nontransverse and garnished with less than five spines. It differs from *Puellina parisiensis* Canu, 1917, in its thin nontransverse peristome, garnished with three spines and not with two tuberosities.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare).

Holotype.—Cat. No. 68529, U.S.N.M.

Genus METRACOLPOSA Canu and Bassler, 1917.

(For description, see Bulletin 106, U. S. National Museum, p. 304.)

METRACOLPOSA MUCRONATA, new species.

Plate 35, fig. 4.

Description:—The zoarium incrusts shells. The zooecia are large, elongate, elliptical, distinct, convex, separated by a deep furrow. The costules, numbering 10 to 12, are wide, robust, convex, and bear some lumen pores; the lacunae are 4 in number and are small and orbicular. The apertura is oblique, elliptical, transverse; its proximal border bears a bifid, salient mucro. The ovicell is large, salient, convex; keeled, sunken in the distal zooecium; it opens in front of the mucro and can not be closed by the operculum.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.10 \text{ mm.} \\ la=0.18 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.40\text{–}0.46 \text{ mm.} \\ lz=0.34\text{–}0.36 \text{ mm.} \end{array}\right.$

Apertura of ovicelled zooecium $\left\{\begin{array}{l} ha=0.15 \text{ mm.} \\ la=0.22 \text{ mm.} \end{array}\right.$

Affinities.—The genus *Metracolposa* was discovered in the American Eocene formations, where it is widely represented by vigorous, bilamellar species. Its presence in the zone of the Pacific seems to indicate a great geographic extension in geologic time. Its presence even in the recent seas is quite probable. We should recall that the mucro of the Cheilostomatous zooecia is an apparatus of protection for the passage of the eggs.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Holotype.—Cat. No. 68530, U.S.N.M.

Family HIPPOTHOIDAE Levinsen, 1909.

Genus HIPPOTHOA (Lamouroux, 1821) Hincks, 1880.

(For description, see Bulletin 106, U. S. National Museum, p. 326.)

HIPPOTHOA HYALINA Linnaeus, 1768.

Plate 35, figs. 5–8.

1768. *Cellepora hyalina* LINNAEUS, Systema Naturae, ed. 12, p. 1286.
1859. *Lepralia hyalina* BUSK, Monograph Fossil Polyzoa of the Crag, Publications Paleontographical Society, London, vol. 14, p. 52, pl. 5, fig. 1.
1880. *Schizoporella hyalina* HINCKS, British Marine Polyzoa, p. 271, pl. 18, figs. 8–10.
1889. *Schizoporella hyalina* JELLY, A synonymic Catalogue Recent Marine Bryozoa, p. 227 (bibliography).
1894. *Schizoporella hyalina* LEVINSEN, Mosdyr. Zoologica Danica (Danske Dyr), Hefte 9, p. 66, pl. 5, figs. 45–47.
1896. *Celleporella hyalina* NORDGAARD, Systemetisk fortegnelse over de i Norge hidtil observer de, arter af marine polyzoa, I, Cheilostomata, Bergen's Musuem Aarbog for 1894–95, No. 2, p. 23.
1900. *Hippothoa hyalina* WATERS, Bryozoa from Franz-Josef Land, Journal Linnean Society London, vol. 18, p. 70, pl. 8, figs. 16–18.
1900. *Celleporella hyalina* NORDGAARD, Den Norske Nordnays-Expedition, Zoology no., vol. 17, p. 10.
1902. *Schizoporella hyalina* CALVET, Bryozoaires marins de la region de Cette, Travaux de l'Institut Zoologie, Université Montpellier, ser. 2, Memoire XI, p. 44.

1903. *Hippothoa hyalina* NORMAN, Notes on the Natural History of East Finnmark, Annals Magazine Natural History, ser. 7, vol. 12, Polyzoa, p. 108.

1904. *Schizoporella hyalina* CALVET, Bryozoen, Ergebnisse der Hamberger Magalhaensiche Sammelreise, p. 25.

1905. *Hippothoa hyalina* NORDGAARD, Hydrographical and biological investigations in Norwegian fiords, Bergen Museum, p. 165.

1906. *Hippothoa hyalina* WATERS, Bryozoa from Chatham Island and d'Urville Island, New Zealand. Annals Magazine Natural History, ser. 7, vol. 17, p. 19.

1906. *Celleporella hyalina* NORDGAARD, Die Bryozoen des westlichen Norwegens, Bergen Musuem Meeres-fauna von Bergen, p. 87.

1907. *Schizoporella hyalina* CALVET, Bryozoaires, Expédition scientifiques *Travailleur* et *Talisman*, p. 415.

1907. *Hippothoa hyalina* NORDGAARD, Campagne arctique de 1907 de Duc D'Orleans. Bryozoaires, p. 9.

1908. *Schizoporella hyalina* ROBERTSON, Incrusting Cheilostomatous Bryozoa of the West Coast of North America, University of California Publications, Zoology, vol. 4, No. 5, p. 289, pl. 19, fig. 43–45 (not synonomy).

1911. *Schizoporella hyalina* GUÉRIN-GANIVET, Contributions a l'étude des Bryozoaires des cotes Armoricaines, II, Bryozoaires provenant de la rade de Brest, Travaux du Laboratoire de Zoologie de Concarneau, vol. 3, p. 2.

1912. *Hippothoa hyalina* OSBURN, The Bryozoa of the Woods Hole Region, Bulletin Bureau Fisheries, vol. 30, 1910, p. 235, pl. 24, fig. 47 (American bibliography).

1912. *Hippothoa hyalina* NORDGAARD, Revision av norske Bryozoer, Kgl. norske Videnskabers Selskabs Skriften, 1911, no. 3, p. 20.

1912. *Schizoporella hyalina* GUÉRIN-GANIVET, Contributions a l'étude des Bryozoaires des cotes Armoricaines, III, Bryozoaires de la region de Concarneau, Travaux scientifiques du Laboratoire de Zoologie de Concarneau, vol. 4, p. 14.

1912. *Schizoporella hyalina* BARROSO, Briozoos de la estacion maritima de Santander, Trabajos del Museo de ciencias naturales, no. 5, p. 16.

1913. *Schizoporella hyalina* GUÉRIN-GANIVET, Bryozoaires de la Mission arctique, Société d'oceanographique de Golfe de Gascogne, fasc. 7, p. 26.

A number of varieties of this widespread recent and fossil species have been described. Their present day arrangement is as follows:

Variety *bougainvillei* D'Orbigny, 1839, is a distinct species.

Variety *discreta* Busk, 1852, is *Diazeuxia reticulans* Jullien, 1888.

Variety *muricata* Busk, 1852, is *Diazeuxia kerguelenensis* Jullien, 1888.

Variety *cornuta* Hincks, 1880, from Australia belongs to another genus.

Variety *cornuta* Hincks, 1880, from Natal is another species.

Variety from Santa Cruz (Hincks, 1880) is a distinct species.

Variety from Australia (MacGillivray) is a distinct species.

Measurements.—Ordinary zooecia: Apertura $\left\{\begin{matrix} ha = 0.10 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{matrix}\right.$

Zooecia $\left\{\begin{matrix} Lz = 0.40 \text{ mm.} \\ lz = 0.14 \text{ mm.} \end{matrix}\right.$

Ovicelled zooecia: Apertura $\left\{\begin{matrix} ha = 0.06 \text{ mm.} \\ la = 0.08 \text{ mm.} \end{matrix}\right.$

Zooecia $\left\{\begin{matrix} Lz = 0.40 \text{ mm.} \\ lz = 0.20 \text{ mm.} \end{matrix}\right.$

Male zooecia: Apertura $\left\{\begin{matrix} ha = 0.04 \text{ mm.} \\ la = 0.04 \text{ mm.} \end{matrix}\right.$

Zooecia $\left\{\begin{matrix} Lz = 0.24 \text{ mm.} \\ lz = 0.12 \text{ mm.} \end{matrix}\right.$

Variations.—The ordinary zooecia and the ovicelled zooecia develop on the same plane. The male zooecia have no fixed place and lap over very often on the others; when they are numerous and erect they give to the zoarium an aspect of *Cellepora*, which explains its generic name of *Celleporella* given by certain authors. The presence of three sorts of zooecia renders this species easy to determine; however, it is not rare to find zoaria uniquely formed of ordinary zooecia, in which case the determination is more difficult.

This species generally lives on algae and the depths indicated by the dredgings gives only information of secondary importance when the substratum is unknown. This is a species of the cold boreal zone and it never goes farther south than the forty-second parallel. We have found in the Pliocene of Monroe County, Florida, a mediocre specimen of a very closely related species. We will only give it a name if we have the chance to find better specimens. Generally its micrometric measurements are more reduced.

Measurements.—Ordinary zooecia: Apertura $\left\{ \begin{array}{l} ha = 0.08 \text{ mm.} \\ la = 0.08 \text{ mm.} \end{array} \right.$

Zooecia $\left\{ \begin{array}{l} Lz = 0.30 \text{ mm.} \\ lz = 0.20 \text{ mm.} \end{array} \right.$

Male zooecia: Apertura $\left\{ \begin{array}{l} ha = 0.04 \text{ mm.} \\ la = 0.04 \text{ mm.} \end{array} \right.$

Zooecia $\left\{ \begin{array}{l} Lz = 0.16\text{–}0.20 \text{ mm.} \\ lz = 0.12 \text{ mm.} \end{array} \right.$

Occurrence.—Pleistocene: Santa Barbara (rare); Dead Man's Island off San Pedro (rare); Los Angeles and Santa Monica, California (rare).

Geological distribution.—Plaisancian of England (Busk).

Habitat.—Arctic Ocean: Iceland (162 meters); Franz Joseph Land (12–150 meters); Barents Sea (106 meters); Jean Mayen; Spitzberg; Greenland (4–48 meters); Sea of Kara; Nova Zembla (3–32 meters). North Sea: Norway; Germany; Denmark (8–27 meters). Eastern Atlantic: Off England, English Channel, Gulf of Gascony. Western Atlantic: Labrador, Woods Hole region. Eastern Pacific: Alaska, California.

Plesiotypes.—Cat. Nos. 68531, 68532, U.S.N.M.

HIPPOTHOA HYALINA, var. RUGOSA, new variety.

Plate 35, fig. 9.

Only the figured specimen has been found; it perhaps forms a distinct species. The large transverse wrinkles of the frontal are very characteristic. The species differ from *Hippothoa bougainvillei* D'Orbigny, 1839, in the absence of two large frontal beaks.

Occurrence.—Pleistocene: Santa Barbara, California (very rare).

Holotype.—Cat. No. 68533,U.S.N.M.

Genus **TRYPOSTEGA** Levinsen, 1909.

(For description, see Bulletin 106, U. S. National Museum, p. 327.)

TRYPOSTEGA VENUSTA Norman, 1864.

Plate 16, fig. 1.

1920. *Trypostega venusta* Canu and Bassler, Monograph North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 330 p. 85, figs. 15, 16 (bibliography and description.).

The earliest appearance of this recent species in the Tertiary rocks of America is in the Vicksburgian of Mississippi and Alabama, where it is quite rare. The Miocene deposits of North Carolina have furnished a very few specimens which differ in no appreciable respect from the typical form.

Occurrence.—Miocene: (Duplin marl) Wilmington, North Carolina (very rare). Miocene (Yorktown formation): 1 mile west of Fort Nonsense, Gloucester County, Virginia (rare).

Geological distribution.—Miocene of Australia (Waters); Vicksburgian of the United States (Canu and Bassler).

Habitat.—Eastern Atlantic: English Channel, Madeira, Azores, Cape Verde Islands. Pacific: Lifu, Loyalty Island, Torres Straits. China Sea, Tozar Bank (43 meters). Indian Ocean: Saya de Malha (46–202 meters); Mauritius; Wasin, British East Africa (162 meters).

Plesiotype.—Cat. No. 68534, U.S.N.M.

Family ESCHARELLIDAE, Levinsen, 1909.

Group , **SCHIZOPORELLAE** Canu and Bassler, 1917.

Genus **SCHIZOPORELLA** Hincks, 1880.

As employed in our Monograph on the North American Early Tertiary Bryozoa, *Schizoporella* is retained for species showing no ovicell and which therefore can not be grouped in their proper place in the Schizoporellae.

SCHIZOPORELLA MAGNIPOROSA, new species.

Plate 45, figs. 1, 2.

Description.—The zoarium incrusts sponges. The zooecia are distinct, separated by a furrow, irregularly hexagonal; the frontal is little convex, porous, perforated by large, scattered tremopores. The apertura is formed of a semicircular anter and of a wide rounded rimule. Near the apertura there are one or two small setiform avicularia.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.18 \text{ mm.} \\ la=0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.65 \text{ mm.} \\ lz=0.50\text{–}0.55 \text{ mm.} \end{array}\right.$

Affinities.—Only the figured specimens have been found, and as they are incomplete and bear no ovicell it is impossible as yet to classify the species generically. The presence of small, oral, vibraculoid avicularia seems to indicate that this species belongs in reality to the genus *Mastigophora.*

The ancestrular zooecia are much smaller. The ancestrula bears a large elliptical aperture occupying almost all its frontal.

This species differs from *Mastigophora porosa* Smitt, 1872, in its larger tremopores and in the smaller apertura.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (rare).

Cotypes.—Cat. No. 68535, U.S.N.M.

SCHIZOPORELLA LATISINUATA Ulrich and Bassler, 1904.

Plate 18, fig. 4.

1904. *Schizoporella latisinuata* Ulrich and Bassler, Bryozoa: Maryland Geological Survey, Miocene, p. 421, pl. 119, fig. 2–4.

Description.—Zoarium forming thin parasitic expansions over foreign bodies. Zooecia sharply distinguished from each other, rather irregularly arranged, often subrhomboidal, four or five in 2 mm.; surface coarsely punctate. Orifice terminal, directed somewhat obliquely forward, subcircular, broadly sinuate proximally, enclosed by a slightly elevated peristome. Avicularia rather small, prominent, one on either or both sides of the orifice, rarely wanting, situated close to the peristome; apparently not divided by a septum. Ovicells not observed. (Ulrich and Bassler.)

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.10 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{array}\right.$ Short zooecia $\left\{\begin{array}{l} Lz = 0.40\text{–}0.45 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{array}\right.$

Long zooecia $\left\{\begin{array}{l} Lz = 0.60 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{array}\right.$

Affinities.—The aperture is as high as wide and buried at the base of a small peristome. The avicularium is infraoral; its beak is directed toward the median axis of the zooecia. The species has the exterior aspect of *Stylopoma isabelleana* Smitt, 1872, but differs in its larger avicularium and in the wider rimule of the aperture. We have not discovered the ovicell and are therefore not able to classify the species generically.

Occurrence.—Miocene (Choptank formation): Jones Wharf, Maryland (rare).

Holotype.—Cat. No. 68536, U.S.N.M.

SCHIZOPORELLA CUMULATA Ulrich and Bassler, 1904.

Plate 16, fig. 10.

1904. *Schizoporella cumulata* Ulrich and Bassler, Maryland Geological Survey Miocene, p. 422, pl. 17, fig. 7.

The original description is as follows:

> Zoarium probably massive, composed of layers of zooecia arranged very irregularly and piled upon each other much as in *Cellepora*. Zooecia of irregular shapes, often broad ovate, convex, large, 0.5 mm. or 0.6 mm. in length and nearly 0.5 mm. in width. Orifice rounded, slightly transverse, the proximal side broadly notched; peristome somewhat elevated, thick. Surface distinctly and abundantly punctate. Avicularia rather variable in size, situated on only one or on both sides of the orifice, the acuminate end of the aperture elevated and turned outwardly. Ovicells not observed.
>
> The general aspect of this bryozoan is decidedly like that of a *Cellepora*, and we can scarcely doubt that it is related to some of the species still referred to that genus. We have placed it under *Schizoporella*, not because we are satisfied that it really belongs there, but for the reason that its zooecial orifices and the avicularia are almost exactly as in other species (e. g., *S. subquadrata* and *S. latisinuata*) that we have referred to this genus. From these it is distinguished principally by the extremely irregular arrangement and piling up of the zooecia.

In the absence of ovicells on the few specimens found we are unable to classify this species in the correct division of the Schizoporellae.

Occurrence.—Miocene (Choptank formation): Jones Wharf, Maryland (very rare). Miocene (St. Mary's formation): Cove Point, Maryland (rare).

Holotype.—Cat. No. 68537, U.S.N.M.

Genus ARTHROPOMA Levinsen, 1909.

(For description see Bulletin 106, U. S. National Museum, p. 351.)

ARTHROPOMA CORNUTA, new species.

Plate 16, fig. 3.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, little elongate, swollen; the frontal is convex covered by large tremopores and ornamented by a small salient median protuberance. The apertura is semilunar, transverse and bears on its rectillinear, proximal border a very small sinus.

Measurements.—Apertura $\begin{cases} ha = 0.10 \text{ mm.} \\ la = 0.14 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.70 \text{ mm.} \\ lz = 0.50 \text{ mm.} \end{cases}$

Affinities.—The form of the rimule leaves no doubt regarding the arrangement of this species in the genus *Arthropoma*. It differs from the genotype *Arthropoma cecili* Audouin, 1826, only in the presence of the small frontal protuberance.

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare).

Holotype.—Cat. No. 68538, U.S.N.M.

Genus DAKARIA Jullien, 1903.

(For description see Bulletin 106, U. S. National Museum, p. 359.)

DAKARIA CHEVREUXI Jullien, 1903.

Plate 45, fig. 7.

1903. *Dakaria chevreuxi* Jullien, Bryozoaires provenant des campagnes de *l'Hirondelle* (1886–1888), Résultats des Campagnes scientifiques du Prince de Monaco, fasc. 23, p. 90, pl. 9, fig. 6.

We have found only a single specimen which is incrusting a coral, but in spite of its mediocre preservation we believe our determination to be exact. Each tremopore is surrounded by a small salient peristome. The oral avicularia are not constant. The proximal lip of the aperture ends in two condyles.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (rare).

Habitat.—Shores of Graciosa Isle, Azores.

Plesiotype.—Cat. No. 68539, U.S.N.M.

DAKARIA GRANDIS, new species.

Plate 20, fig. 16.

Description.—The zoarium incrusts shells. The zooecia are *large*, distinct, elongated, elliptical, separated by a deep furrow; the frontal is convex, ornamented with numerous small tremopores and minute granulations. The apertura is orbicular or somewhat transverse; two strong condyles placed in the lower third limit the broad rounded sinus; the peristome is entire, thin, salient, finally denticulated.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.25 \text{ mm.} \\ la=0.25 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.95 \text{ mm.} \\ lz=0.55\text{–}0.60 \text{ mm.} \end{array}\right.$

Affinities.—This species is very close to the genotype *Dakaria chevreuxi* Jullien, 1904, but it differs in the absence of salient threads between the zooecia, which are also more elongated and especially in the larger micrometric dimensions ($Lz=0.75$ mm.).

Occurrence.—Miocene (Yorktown formation): Yorktown, Virginia (rare).

Holotype.—Cat. No. 68540, U.S.N.M.

DAKARIA TORQUATA D'Orbigny, 1839.

Plate 12, figs. 8, 9.

1839. *Escharina torquata* D'Orbigny, Voyage dans l'Amerique-Meridionale, vol. 5, pt. 4, Zoophytes, p. 11, pl. 4, figs. 1–4.

1845. *Escharina tumidula* Lonsdale, Report on the Corals from the Tertiary formations of North America, Quarterly Journal Geological Society, London, vol. 1, p. 502. (Not *Flustra torquata* Lamouroux, 1827, Encyclopedie Méthodique, vol. 14, p. 407.)

1851. *Cellepora subtorquata* D'Orbigny, Paleontologie francaise, Terrain Cretace, vol. 5, Bryozoaires, p. 399.

1905. *Cellepora subtorquata* Waters, Notes on some Recent Bryozoa in D'Orbigny's Collection, Annals Magazine Natural History, ser. 7, vol. 15, p. 6.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.15\text{mm.} \\ la=0.15 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50 \text{ mm.} \\ lz=0.40 \text{ mm.} \end{array}\right.$

Affinities.—In 1851 D'Orbigny having noted that his *Escharina torquata* was not *Flustra torquata* Lamouroux, 1827, changed its name. Examining the type of the species Waters, 1905, wrote "D'Orbigny's figure is good, but the lateral wings by the side of the sinus project more than is figured." In 1884 Hincks believed he had found D'Orbigny's species in the Pacific off California, but his good figure would not really permit this identification; the primitive name of *Schizoporella dawsoni* Hincks, 1883, applied by him to this species must therefore be preserved. The description and figure of Lonsdale leaves no doubt; we have indeed rediscovered his *Escharina tumidula* and in the same locality, namely, Petersburg, Virginia. D'Orbigny's figure of the species is much better than that of Lonsdale. This species differs from *Schizobrachiella sanguinea* Norman, 1868, and *Dakaria chevreuxi* Jullien, 1903, in a larger rimule and in the smaller micrometric dimensions. It incrusts shells and has no dietellae.

Occurrence.—Miocene (Yorktown formation): 3 miles southwest of Petersburg (rare) and 2 miles southwest of Cash, Gloucester County, Virginia (rare).

Habitat.—Atlantic: Bay of Rio de Janeiro, Brazil.

Plesiotypes.—Cat. No. 68541, U.S.N.M.

DAKARIA PARVIPOROSA, new species.

Plate 30, fig. 1.

Description.—The zoarium incrusts oysters. The zooecia are distinct, long, separated by a furrow; the frontal is convex and formed by a tremocyst with very small pores. The apertura is large, orbicular with a very wide rimule of little depth.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.16 \text{ mm.} \\ la=0.16 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{–}0.60 \text{ mm.} \\ lz=0.36\text{–}0.40 \text{ mm.} \end{array}\right.$

Affinities.—This species differs from *Schizoporella insculpta* Hincks, 1883, only in the absence of the oral armature of the rimule and in the absence of a furrow near the apertura. The figured specimen is the only one that has been found; it lacks the ovicell and we can not make any close comparisons.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (very rare).

Holotype.—Cat. No. 68542, U.S.N.M.

Genus LACERNA Jullien, 1888.

(For description see Bulletin 106, U. S. National Museum, p. 345.)

LACERNA MUCRONATA Smitt, 1872.

Plate 16, fig. 2.

1872. *Hippothoa mucroneta* Smitt, Floridan Bryozoa, pt. 2, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, no. 4, p. 45, pl. 8, fig. 169.

Our determination of the American specimens is exact. We can observe on our specimens the same costules, the six spines, the wide rimule and the complete peristome indicated on Smitt's figure.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (very rare).

Habitat.—Florida (47 meters).

Plesiotype.—Cat. No. 68543, U.S.N.M.

Genus STEPHANOSELLA Canu and Bassler, 1917.

(For description see Bulletin 106, U. S. National Museum, p. 343.)

STEPHANOSELLA BIAPERTA Michelin, 1842.

Plate 16, figs. 4–9.

Zoological bibliography.

1889. *Schizoporella biaperta* Jelly, Synonymic Catalogue Recent Marine Bryozoa, p. 223 (bibliography).

1901. *Schizoporella biaperta* Whiteaves, Catalogue of the Marine Invertebrata of Eastern Canada, Geological Survey of Canada, Bull. no. 722, p. 100.

1907. *Schizoporella biaperta* Calvet, Expedition scientifique *Travailleur* et *Talisman*, p. 419 (bibliography).

1908. *Schizoporella biaperta* Robertson, The Incrusting Chilostomatous Bryozoa of the West Coast of North America, University of California Publications, Zoology, vol. 4, p. 287, pl. 19, fig. 41.

1909. *Schizoporella biaperta* Norman, The Polyzoa of Maderia and neighboring Islands, Journal Linnean Society London, Zoology, vol. 30, p. 303, pl. 40, figs. 3, 4 (var. *divergens*).

1912. *Schizoporella biaperta* Osburn, The Bryozoa of the Woods Hole Region, Bulletin Bureau Fisheries, vol. 30, p. 237, pl. 29, fig. 49.

1912. *Schizoporella biaperta* Guerin-Ganivet, Contributions a l'étude des Bryozoaires des cotes Armoricaines, III, Bryozoaires de la region de Concarneau, Travaux scientifiques du Laboratoire de Zoologie de Concarneau, vol. 4, p. 13.

1912. *Schizoporella biaperta* Nordgaard, Campague arctique de 1907, de Duc d'Orleans, Bryozoaires p. 40.

1912. *Schizoporella biaperta* Barroso, Briozoos de la Estacion de Biologia maritima de Santander, Trabajos del Museo de Ciencias naturales, no. 5, p. 40.

1914. *Schizoporella biaperta* Osburn, The Bryozoa of the Tortugas Islands, Publication Carnegie Institution of Washington, no. 182, p. 207.

Paleontological bibliography.

1842. *Eschara biaperta* Michelin, Iconographie zoophytologique, p. 330, pl. 79, fig. 3.

1859. *Lepralia biaperta* Busk, Monograph Fossil Polyzoa of the Crag, Publications Paleontographical Society, London, vol. 14, p. 47, pl. 7, fig. 5.

1862. *Reptescharellina cornuta* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences of Philadelphia, ser. 2, vol. 5, p. 147, pl. 20, fig. 31.

1875. *Lepralia biaperta* Manzoni, I Briozoi del pliocene antico di Castrocaro, p. 21, pl. 2, fig. 28.

1878. *Lepralia biaperta* Waters, Bryozoa (Polyzoa) from the Pliocene of Bruccoli (Sicily), Transactions Manchester Geological Society, vol. 14, p. 13, fig. 8.

1879. *Lepralia biaperta* Seguenza, Le formazioni terziarie nella Provincia di Reggio (Calabria), Reale Accademia dei Lincei, Memorie della Classe di Scienze Fisiche, Matematiche e Naturali, ser. 3, vol. 6, pp. 81, 202.

1887. *Lepralia biaperta* Waters, On Tertiary Bryozoa from New Zealand, Quarterly Journal Geological Society, London, vol. 43, p. 65.

1895. *Schizoporella biaperta* MacGillivray, Monograph Tertiary Polyzoa of Victoria, Transactions Royal Society of Victoria, vol. 4, p. 85, pl. 11, fig. 20.

1895. *Schizoporella biaperta* Neviani, Briozoi fossili della Farnesina e Monte Mario presso Roma, Paleontographica Italica, vol. 1, p. 110 (sep. 34).

1896. *Schizoporella biaperta* Neviani, Briozoi Postpliocenici di Spilinga (Calabria), Atti Accademia Gioenia di Scienze Naturali in Catania, ser. 4, vol. 9, p. 33, fig. 16.

1896–1898. *Schizoporella biaperta* Neviani, Briozoi neozoici di alcune localita d'Italia, Bollettino della Societa Romana per gli Studi Zoologica, pt. 3, p. 111 (sep. 10); pt. 5, pp. 4, 7.

1897. *Schizoporella biaperta* Neviani, Corallari e Briozoi neogenici di Sardigna, Bolletino della Società Geologica Italiana, vol. 15, p. 588 (sep. 20).

1901. *Schizoporella biaperta* Neviani, Briozoi neogenici della Calabrie Paleontographia Italiana, vol. 6, p. 195 (sep. 8) (regional bibliography).

1905. *Schizoporella biaperta* Neviani, Briozoi fossili di Carrubare (Calabria), Bollettino Societa Geologica Italiana, vol. 23, p. 532 (sep. 30).

1919. *Stephanosella biaperta* Canu and Bassler, Geology and Paleontology of the West Indies, Paleontology, Publications Carnegie Institution of Washington, no. 292, p. 91, pt. 1, figs. 16–18.

1920. *Stephanosella biaperta* Canu and Bassler, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 344.

Measurements.—$\text{Apertura}\left\{\begin{array}{l} ha=0.10\text{ mm.}\\ la=0.10\text{–}0.12\text{ mm.}\end{array}\right.$ $\text{Zooecia}\left\{\begin{array}{l} Lz=0.40\text{ mm.}\\ lz=0.30\text{ mm.}\end{array}\right.$

Variations.—This species is quite variable in its external aspects and in its micrometric measurements. The ovicelled zooecia are oriented in all directions; this absolutely inexplicable phenomenon characterizes this species and contributes much to making it often absolutely unrecognizable.

We give figures of specimens chosen from different formations which will suffice to enable the reader to avoid errors of determination. The specimens with large tremopores should possibly be separated as a variety, in which case Gabb and Horn's name of *cornuta* would be available. This is one of the few species common to both the Atlantic and Pacific.

Occurrence.—Miocene (Bowden marl): Bowden, Jamaica (rare). Miocene (Duplin marl): Wilmington, North Carolina (rare). Pleistocene: Los Angeles (rare). Dead Mans Island off San Pedro (very rare), and Santa Monica, California (rare); Vero, Florida (rare).

Geological distribution.—Miocene of Australia (MacGillivray); Helvetian of France (Michelin), of Sardinia (Neviani), and Italy (Seguenza); Zanclean of Italy (Seguenza, DeStefani); Sahelian of Oran (Collection Canu); Plaisancian of England

(Busk), of Italy (Manzoni); Sicilian of Italy (Neviani, Waters); Quaternary of Italy (Neviani); Pliocene of New Zealand (Waters).

Habitat.—Arctic Ocean: Kara Sea, Spitzberg, Greenland, Jean Mayen (160–180 meters), Alaska (circumpolar species). Eastern Atlantic: North Sea, English Channel, England, Brittany, Gulf of Gascony (166 meters), Spain, Madeira (48 meters), Azores (130 meters). Western Atlantic: Woods Hole region (5–32 meters), Florida (14–97 meters). Eastern Pacific: Queen Charlotte Islands, California (213 meters). Western Pacific: Japan. Southern Pacific: Australia, New Zealand. Mediterranean: Nice, Naples, Corse (22–110 meters), Ajaccio (280 meters), Bonifacio (55–77 meters), Algeria (121 meters), and north of Morocco (370 meters).

Plesiotypes.—Cat. Nos. 68544–68546, U.S.N.M.

Genus STYLOPOMA Levinsen, 1909.

1909. *Stylopoma* LEVINSEN, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, pl. 18 (name only).

1920. *Stylopoma* CANU and BASSLER, Monograph North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 359.

The ovicell is hyperstomial; it covers the apertura and the avicularia entirely. The frontal is a tremocyst. The apertura is provided with a small linear rimule.

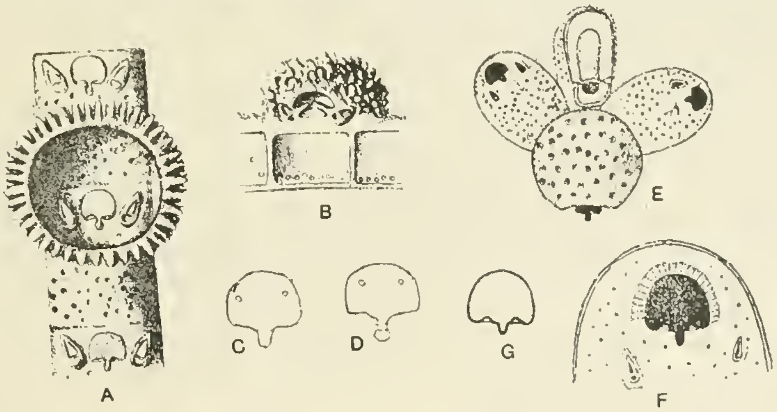


FIG. 15.—Genus *Stylopoma* Levinsen, 1909.

A.–H. *Stylopoma spongites* Pallas, 1766. A. Zooecium, × 40, with an ovicell, the frontal half of which is cut away. B. drawing, × 6, showing an ovicell from the proximal end and distal walls with septulae. C, D. Opercula, × 100. (A–D, after Levinsen, 1909.) E. Zooecia, × 25, showing ovicell and vicarious avicularium. F. A zooecium, × 85, showing the oral denticles from the front. G. Operculum, × 85. (E–G, after Waters, 1918.)

Genotype.—Stylopoma (*Eschara*) *spongites* Pallas, 1766. Range: Miocene–Recent.

Levinsen proposed this genus for *Eschara spongites* and *Schizoporella longirostris* Hincks, 1886, but having recognized that the size of the rimule upon which he based it is not a generic character, he suppressed the name. We reestablish the genus, basing it upon the function of the passage of the eggs, which operates in a very different manner from that in *Schizopodrella,* where the species would otherwise have been placed. The great development of the ovicell above the aperture assures this function. *Schizoporella longirostris* Hincks, 1886, has the same type of orifice, but not being provided with this ovicell it must be classified in *Schizopodrella.*

STYLOPOMA SPONGITES Pallas, 1766.

Plate 17, figs. 1–12.

1766. *Eschara spongites* Pallas, Elenchus Zoophytorum, p. 45.
1797. *Cellepora spongites* Esper, Die Pflanzenthiere, p. 242, pl. 111.
1803. *Eschara spongites* Moll, Die Seerinde aus der Ordnung der Pflanzenthiere, Wien, pl., figs. 3A, 3B.
1821. *Cellepora spongites* Lamouroux, Exposition methodique des genres de Polypiers, p. 41, fig. 3.
1845. *Cellepora informata* Lonsdale, Report on the Corals from the Tertiary formations of North America, Quarterly Journal Geological Society London, vol. 1, p. 505 (text fig.).
1857. *Reptocelleporaria informata* Tuomey and Holmes, Pliocene Fossils of South Carolina, p. 15, pl. 4, figs. 11, 12.
1862. *Reptocelleporaria informata* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences of Philadelphia, ser. 2, vol. 5, p. 132.
1872. *Hippothoa spongites* Smitt, Floridan Bryozoa, pt. 2, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, no. 4, p. 42, pl. 8, figs. 161–163.
1889. *Schizoporella spongites* Jelly, Synonymic Catalogue of Marine Bryozoa, p. 234 (bibliography).
1904. *Schizoporella informata* Ulrich and Bassler, Bryozoa, Maryland Geological Survey, Miocene, p. 419, pl. 114, figs. 6–10.
1909. *Schizoporella spongites* Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 323, pl. 18, figs. 3, 4 (*Stylopoma spongites* on plate).
1914. *Schizoporella spongites* Osburn, The Bryozoa of the Tortugas Islands, Publication Carnegie Institution of Washington, no. 182, p. 207.
1919. *Stylopoma spongites* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 91, pl. 1, fig. 13.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.14\text{ mm.}\\ la=0.10\text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{ mm.}\\ lz=0.36\text{ mm.}\end{array}\right.$

Historical.—The bibliography published by Miss Jelly in 1889 was determined by Smitt, 1872, and appears inexact to us. This species is absolutely restricted to the Gulf of Mexico. By what chance could it have fallen into the hands of the eighteenth century authors? Certainly the species which they figured is the *Schizopodrella unicornis* Johnston, 1847, or *Schizopodrella longirostris* Hincks, 1886, which also present large multilamellar and spongy zoaria. We believe that the name of Lonsdale, 1845, would be preferable.

Variations.—The ovicell of this species is quite remarkable; a superb study was made by Levinsen, 1909. An ordinary polypide forms the zooecium. It degenerates and is replaced by a female polypide which forms the ovicell above the distal zooecium and the apertura. It is deprived of tentacles which could scarcely issue from the special orifice of the ovicell. The passage of the eggs is thus assured in a positive fashion. The escape of the larvae operates as in the species of the genus *Schizopodrella* by the rupture of the membrane which closes the ovicell.

The variations of this species are extraordinary. The avicularium is present or absent, large or small. The zooecia are long or short, narrow or swollen, even transverse. Frequently they are oriented in all directions.

The zoaria contain a large number of lamellae piled one on another; their dimensions reach a length of 5 centimeters. The larvae are fastened on shells, on other bryozoa, and more frequently on the fronds of small algae.

Occurrence.—Miocene (Yorktown formation): Yorktown and 3 miles southwest of Petersburg, Virginia (common). Miocene (Duplin marl): Wilmington, and other localities in North Carolina (common); Darlington, Muldrows Mills, 5 miles south of Maysville, and other localities, South Carolina (rare). Pliocene (Caloosahatchee marl): Shell Creek, De Soto County and Munroe County, Florida (common). Pleistocene: Simmons Bluff, Yonge's Island, Charleston County, South Carolina (rare); Mount Hope, Panama Canal Zone (rare). Pleistocene or Recent: Vero, Florida (rare).

Habitat.—Gulf of Mexico off Florida (21–56 meters), Tortugas (29 meters), Bermuda, St. Thomas, St. John, and perhaps at Malacca (Levinsen).

Plesiotypes.—Cat. Nos. 68547–68553, U.S.N.M.

STYLOPOMA PROJECTA, new species.

Plate 45, fig. 6.

Description.—Zoarium incrusting. Zooecia distinct, separated by a furrow, regularly oriented, sub-rectangular; frontal convex and garnished with numerous tremopores. Aperture small, transverse, with a small, narrow rimule; rounded at its extremity; peristome thick, salient, smooth. A small oral avicularium with pointed and *very salient* beak is adjacent to the rimule and to the aperture. The ovicell is enormous, globular ornamented with tremapores; it hides the aperture. The interzooecial avicularium is large, convex, with rounded and somewhat enlarged beak.

Measurements.—Aperture $\begin{cases} ha = 0.10 \text{ mm.} \\ la = 0.11 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50\text{–}0.55 \text{ mm.} \\ lz = 0.30\text{–}0.40 \text{ mm.} \end{cases}$

Affinities.—This species is very well characterized by its small oral avicularium arranged to the right or to the left of the rimule, an arrangement not observed in other known species.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (rare).

Plesiotype.—Cat. No. 68554, U.S.N.M.

STYLOPOMA MAGNIPOROSA, new species.

Plate 47, fig. 4.

Description.—The zoarium is bilamellar. The zooecia are large, elongated, distinct, separated by a furrow, elliptical; the frontal is convex and perforated by *large* expanded *tremopores.* The apertura is elongated; the anter is orbicular and very large; the poster is formed by a small narrow rectilinear rimule; the peristome is thick, little salient, smooth. On each side of the apertura there are two triangular oblique avicularia with the beak directed toward the base. The ovicell is enormous, globular, placed on the distal zooecium, covering and hiding the aperture.

Measurements. — Apertura $\begin{cases} ha = 0.20 \text{ mm.} \\ la = 0.15 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.60\text{–}0.70 \text{ mm.} \\ lz = 0.45\text{–}0.50 \text{ mm.} \end{cases}$

Affinities.—This species differs from *Stylopoma isabelleana* D'Orbigny in its large frontal tremopores and in the beak of the avicularia directed toward the base. We have observed a giant aperture corresponding probably to a special or abnormal mandible.

Occurrence.—Miocene (Bowden horizon): Santo Domingo.

Holotype.—Cat. No. 68555, U.S.N.M.

STYLOPOMA MINUTA, new species.

Plate 3, fig. 8.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by deep furrows, elongated, *small*; the frontal is convex and provided with small tremopores. The apertura is small, transverse, semielliptical with a narrow rectangular rimule on the proximal, rectilinear border; the peristome is thin, sharp, salient. The ovicell is very large, globular, provided with protuberances and entirely covers the apertura. In the vicinity of the apertura there is a small triangular avicularium with pivot, the beak of which is turned obliquely toward the top.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.05 \text{ mm.} \\ la=0.07 \text{ mm.} \end{array}\right.$ Zooecium $\left\{\begin{array}{l} Lz=0.40\text{–}0.45 \text{ mm.} \\ lz=0.25\text{–}0.30 \text{ mm.} \end{array}\right.$

This is the smallest known species of the genus *Stylopoma*.

Occurrence.—Miocene (Bowden marl): Bowden, Jamaica (rare).

Holotype.—Cat. 68556, U.S.N.M.

Genus SCHIZOPODRELLA Canu and Bassler, 1917.

(For description, see Bulletin 106, U. S. National Museum, p. 338.)

SCHIZOPODRELLA ACULEATA, new species.

Plate 31, figs. 13, 14.

Description.—The zoarium is massive, very large and formed of many superposed lamellae. The zooecia are little distinct, elongated, separated by an irregular furrow, elliptical or rectangular; the frontal is a tremocyst with large, widened pores. The apertura is suborbicular and bears a wide, rounded rimule of little depth; the peristome is thin, complete and salient on the zooecia of the internal lamellae. The ovicell is globular, salient, covered with tremopores. The avicularium with pivot is placed in the vicinity of the apertura; it is very long and terminates in a point.

Measurements.—Apertura $\left\{\begin{array}{l} ho=0.15 \text{ mm.} \\ lo=0.12\text{–}0.15 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.45 \text{ mm.} \\ lz=0.25 \text{ mm.} \end{array}\right.$

Affinities.—This species differs from *Schizoporella cumulata* Ulrich and Bassler, 1904, in the length of its avicularium ($L=0.40$ mm.). It differs from *Schizopodrella longirostris* Hincks, 1886, which also bears a large avicularium, in the much greater width of its rimule. When the large avicularium is not much developed *S. aculeata* much resembles *Stylopoma spongites* Pallas, 1766; it differs from it in its rimule which is wide and concave and not small and rectangular and also in the different form of the ovicell. It differs from *Schizopodrella unicornis* Johnston, 1847, in which the apertura is identical, in the presence of a single very large avicularium.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (very rare).

Cotypes.—Cat. No. 68557, U.S.N.M.

SCHIZOPODRELLA MUTABILIS Canu and Bassler, 1919.

Plate 6, figs. 3–5.

1919. *Schizopodrella? mutabilis* CANU and BASSLER, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 90, pl. 6, figs. 3–5.

Description.—The zoarium is unilamellar, tubular; it incrusts the fine radicells of algae. The zooecia are little distinct, elongate, elliptical; the frontal is little convex, surrounded by areolar pores and garnished with some large tremopores. The apertura is elongate, oval, with a wide rimule separated from the anter by two salient condyles.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.18\text{–}0.20 \text{ mm.} \\ la=0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.70 \text{ mm.} \\ lz=0.34 \text{ mm.} \end{array}\right.$

Affinities.—The very thick incrustation of the tremocyst renders the aspect of this species quite changeable and sometimes absolutely unrecognizable. We have not discovered the ovicell, so the classification naturally remains doubtful. It is possible that our specimens represent the incrusting base of some branching form like *Gemelliporella punctata* Canu and Bassler, 1919, but until the discovery of more specimens this point must remain in doubt.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare).

Holotype.—Cat. No. 68558, U.S.N.M.

SCHIZOPODRELLA UNICORNIS Johnston, 1847.

Plate 17, figs. 13, 14.

1847. *Lepralia unicornis* JOHNSTON, History of British Zoophytes, ed. 2, p. 320, pl. 57, fig. 1.
1880. *Schizoporella unicornis* HINCKS, British Marine Polyzoa, p. 238, pl. 35, figs. 1–5.
1889. *Schizoporella unicornis* JELLY, Synonymic Catalogue of Marine Bryozoa, p. 236 (general bibliography).
1904. *Schizoporella subquadrata* ULRICH and BASSLER, Maryland Geological Survey, Miocene, p. 420, pl. 114, fig. 1; pl. 118, figs. 5, 6.
1906. *Schizoporella unicornis* CANU, Bryozoaires fossiles des Terrains du Sud-Ouest de la France, I Aquatanien, Bulletin de la Société géologique de France, p. 516 (biliography).
1907. *Schizoporella unicornis* CALVET, Expéditions scientifiques du *Travailleur* et du *Talisman*, vol. 8, p. 417 (bibliography).
1914. *Schizoporella unicornis* OSBURN, The Bryozoa of the Tortugas Islands, Publications Carnegie Institute of Washington, No. 182, p. 205 (American bibliography).
1918. *Schizoporella unicornis* WATERS, Marine Fauna fo the Cape Verde Islands, Linnean Society's Journal Zoology, vol. 34, p. 14, pl. 2, figs. 14–17, 22 (bibliography).
1919. *Schizopodrella unicornis* CANU and BASSLER, Geology and Paleontology of the West Indies, Bryozoa, Publication of the Carnegie Institution of Washington, no. 291, p. 90.

This species may easily be confused with *Stylopoma spongites* Pallas, 1766; it is distinguished from it by the wide, proximal sinus of its apertura and by the quite different form of its ovicell.

S. unicornis is quite diffused through the European Tertiary formations, but on the contrary is quite rare in America, although its geologic distribution here appears to be almost identical.

Occurrence.—Lower Miocene: (Bowden formation): Bowden, Jamaica (rare). Miocene (Choptank formation): Governor Run, Maryland (rare). Miocene (Duplin marl): Muldrows Mills, 5 miles south of Maysville, South Carolina (very rare); Wilmington, Natural Well, 2 miles southwest of Magnolia, etc., North Carolina (rare). Miocene (Yorktown formation): 1 mile west of Fort Nonsense, Gloucester County and other localities in Virginia (rare). Miocene (St. Mary's formation): Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia (rare). Pliocene (Caloosahatchee marl): Monroe County, Florida (rare). Pleistocene: Simmons Bluff, Younges Island, Charleston County, South Carolina; Daytona, Florida (rare).

Geologic distribution.—In Europe since the Stampian.

Habitat.—Atlantic, Mediterranean, and boreal seas.

Plesiotype.—Cat. Nos. 68559–68565, U.S.N.M.

SCHIZOPODRELLA FLORIDINA Osburn, 1914.

Plate 16, figs. 11–15.

1914. *Schizoporella floridina* OSBURN, The Bryozoa of the Tortugas Islands, Florida, Publications Carnegie Institute of Washington, No. 182, p. 206, text figs. 17, 18.

Variations.—The zoarium is massive and formed of a number of superposed lamellae. Sometimes the zooecia are not oriented and are distributed in all directions. The large avicularium is very fragile and easily altered by fossilization. The aperture in our fossil specimens is not exactly similar to that figured by Osburn differing slightly in its rimule not placed at the level of the frontal. We have not observed moreover the large interzooecial avicularium.

Occurrence.—Miocene (Duplin marl): Wilmington and Lake Waccamaw, North Carolina (rare). Miocene (Choctawhatchee marl): Jackson Bluff, Ocklockonee River, 25 miles southwest of Tallahassee, Florida (very rare).

Cotypes.—Cat. Nos. 68566, 68567, U.S.N.M.

SCHIZOPODRELLA PUSILLA, new species.

Plate 17, figs 18, 19.

Description.—The zoarium is free and bilamellar or incrusting. The zooecia are *small*, little distinct, elongated, claviform; the frontal is somewhat convex, perforated by some large tremopores. The apertura is as high as wide; the rimule is wide, rounded, little deep. The ovicell is globular, hyperstomial. There are generally two small triangular avicularia with very salient beak placed on each side of the apertura.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.10\text{–}0.12\text{ mm.} \\ la=0.10\text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.54\text{ mm.} \\ lz=0.24\text{ mm.}\end{array}\right.$

Affinities.—This species has much resemblance to *Schizopodrella patagonica* Waters, 1905, in the arrangement of its avicularia; it differs from it in its larger avicularia, placed lower, salient and always inclined toward the aperture. The zooecia, although usually plain, are sometimes margined by a slightly salient thread.

Occurrence.—Miocene (Choctowhatchee marl): Jackson Bluff, Ocklockonee River, 25 miles southwest of Tallahassee, Florida (rare).

Holotype.—Cat. No. 68568, U.S.N.M.

SCHIZOPODRELLA MARGINATA, new species.

Plate 30, figs. 4, 5.

Description.—The zoarium incrusts oysters. The zooecia are distinct, oval, wide, bordered by a wide thread, little salient joined to the peristome; the frontal is little convex and ornamented with large tremopores. The apertura is orbicular; the rimule is wide, of little depth, triangular. The ovicell is little salient, much embedded in the distal zooecium with a frontal area. On each side of the apertura there are two small round avicularia without pivot.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.10 \text{ mm.} \\ la=0.08\text{–}0.10 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50 \text{ mm.} \\ lz=0.28\text{–}0.40 \text{ mm.} \end{array}\right.$

Affinities.—This small species is quite well characterized and easy to determine. It differs from *Schizopodrella pusilla*, new species, in its great zooecial width and in the triangular form of the rimule.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare).

Holotype.—Cat. No. 68569, U.S.N.M.

SCHIZOPODRELLA DOVERENSIS Ulrich and Bassler, 1904.

Plate 18, figs. 1–3.

1904. *Schizopodrella doverensis* Ulrich and Bassler, Bryozoa, Geological Survey Maryland, Miocene, p. 421, pl. 117, fig. 1.

Description.—Zoarium a thin sheet on foreign bodies, the figured specimen growing on the reverse of *Retepora doverensis.* Zooecia well distinguished from each other but with the surface rather flat; irregularly arranged, though their elongate form gives some prominence to the longitudinal rows; average length 0.6 mm., width 0.35 to 40 mm. Orifice terminal, slightly transverse, broadly notched on the proximal side, on the whole nearly circular. Surface reticulate, only slightly convex, the central portion appearing flattened. Avicularia rather small, prominent, one on either or both sides of the orifice, rarely wanting, situated close to the peristome; apparently both divided by a septum. Ovicells not observed. (Ulrich and Bassler.)

Affinities.—The zooecia are not always regularly oriented. The zoarium incrusts shells or other bryozoa.

This species differs from *Schizopodrella unicornis* Johnston, 1847, whose apertura is identical, in its larger dimensions and in the absence of the frontal protruberance. It differs from *Schizobrachiella* (*Escharella*) *sanguinea* Smitt, 1872, in its single very large avicularium and in the smaller and more numerous tremopores. It differs from *Stylopoma* (*Hippothoa*) *isabelleana* Smitt, 1872, in the place of its avicularium not situated below the apertura.

Occurrence.—Miocene (Choptank formation): Dover bridge, Maryland (rare). Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida (very rare).

Plesiotypes.—Cat. No. 68570, U.S.N.M.

Genus SCHIZOLAVELLA Canu and Bassler, 1920.

1920. *Schizolavella* Canu and Bassler, North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 358.

SCHIZOLAVELLA VULGARIS Moll, 1803.

Plate 35, fig. 10.

1803. *Eschara vulgaris* Moll, Die Seerinde, p. 55, pl. 3, fig. 10.
1867. *Lepralia botterii* Heller, Die Bryozoen des Adriatischen Meeres, Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien, vol. 7, p. 30, pl. 2, fig. 4.
1880. *Schizoporella vulgaris* Hincks, British Marine Polyzoa, p. 244, pl. 37, fig. 7; pl. 40, figs. 5, 6.
1880. *Lepralia vulgaris* Seguenza, Le formazioni terziarie della Provincia di Reggio (Calabria), Reale Accademia dei Lincei, ser. 3, vol. 6, pp. 202, 295, 369, (not *Lepralia otophora* of the same author).
?1885. *Pachykraspedon otophorum* Koschinsky, Ein Beitrag zur Kenntnis der Bryozoenfauna der älteren Tertiärschichten des südlichen Bayerns, Paleontographica, vol. 32, p. 44.
1889. *Schizoporella vulgaris* Jelly, A Synonymic Catalogue of Recent Marine Bryozoa, p. 238 (bibliography) (not *Lepralia cognata* Reuss).
1889. *Schizoporella vulgaris* Pergens, Notes succinctes sur les Bryozoaires, du Miocène de la Russie méridionale, Bulletin des Séances de la Société Royale Malacologique de Belgique, vol. 24, p. 5.
1895. *Schizoporella vulgaris* Neviani, Briozoi fossili della Farnesina, Palaeontographica Italica, vol. 1, p. 113 (3), pl. 6, fig. 13.
1896. *Schizoporella vulgaris* Neviani, Briozoi Postpliocenici di Spilinga (Calabria), Atti Accademia Gioenia di Scienze Naturali in Catania, ser. 4, vol. 9, p. 32.
1896. *Schizoporella vulgaris* Calvet, Campagne du *Caudan*, Bryozoaires, Annales de l'Université de Lyon, p. 258.
1898–1900. *Schizoporella vulgaris* Neviani, Briozoi neozoici di alcune localita d'Italia, Bolletino della Società Romana per gli Studi Zoologici, pt. 4, vol. 5, p. 11; pt. 5, vol. 7, pp. 4, 7, 13; pt. 6, vol. 8, p. 67 (sep. 10), 1900.
1899. *Schizoporella vulgaris* Waters, Bryozoa from Madeira, Journal Royal Microscopical Society, pp. 11, 16, pl. 3, figs. 9–11.
1900. *Schizoporella vulgaris* Neviani, Briozoi neogenici della Calabria, Palaeontographia Italica, vol. 6, p. 196 (sep. 82) (Bibliography regional).
1902. *Schizoporella vulgaris* Calvet, Bryozoaires marins des cotes de Corse, Travaux de l'Institut Zoologique de Montpellier, ser. 2, mem. 12, p. 21.
1902. *Schizoporella vulgaris* Calvet, Bryozoaries marins de la region de Cette, Travaux de l'Institut Zoologique de Montpellier, ser. 2, mem. 8, p. 41.
1903. *Schizoporella vulgaris* Jullien, Bryozoaires provenant des Campagnes de *l'Hirondelle*, pp. 79, 136.
1905. *Schizoporella vulgaris* Neviani, Briozoi fossili di Carrubare (Calabria), Bollettino della Società Geologica Italica, vol. 21, pt. 1, p. 533 (sep. 31), fig. 12.
1907. *Schizoporella vulgaris* Calvet, Expédition scientifiques du *Travailleur* et du *Talisman*, p. 417 (bibliography).
1909. *Escharina vulgaris* Norman, Polyzoa of Madeira, Linnean Society's Journal, vol. 30, p. 302.
1912. *Schizoporella vulgaris* Canu, Etude comparée des Bryozoaires Helvétians de l'Egypte avec les Bryozoaires vivants de la Méditerranée et de la mer Rouge, Memoires de l'Institut Egyptien, vol. 6, p. 213, pl. 11, fig. 6 (palaeontological, illustrated bibliography).

This species has never been noted except in the eastern Atlantic from the English Channel to the Cape Verde Islands and in the Mediterranean. It is not known in the Pacific. However, Waters has noted the fossil form in the Miocene of Australia. Our specimen from the Pleistocene is undoubtedly of this species.

It is therefore probable that its geographic extension is greater than we had supposed hitherto.

Occurrence.—Pleistocene: Santa Barbara, California (very rare).

Geological distribution.—Stampian of Germany (Reuss); Casselian of Germany (Reuss); Miocene of Australia (Waters); Burdigalian of Gard (Canu collection); Helvetian of Italy (Seguenza, Neviani), of Gard, of Herault, and of Touraine (Canu collection); Tortonian of Italy (Seguenza), of Austria-Hungary (Reuss); Sahelian of Oran (Canu collection); Zanclean of Italy (Seguenza); Plaisancian of Italy (Manzoni, Neviani); Astian of Italy (Seguenza); Sicilian of Italy (Neviani, Waters); Quaternary of Italy (Neviani, Seguenza).

Habitat.—Eastern Atlantic; English Channel, Gulf of Gascony (155–180 meters) Madeira, Cape Verde Islands, Azore Islands (89–130 meters). Mediterranean, Black Sea, Adriatic, Corse (5–77 meters), Cette (20–40 meters), Oran (75–121 meters).

Plesiotype.—Cat. No. 68571, U.S.N.M.

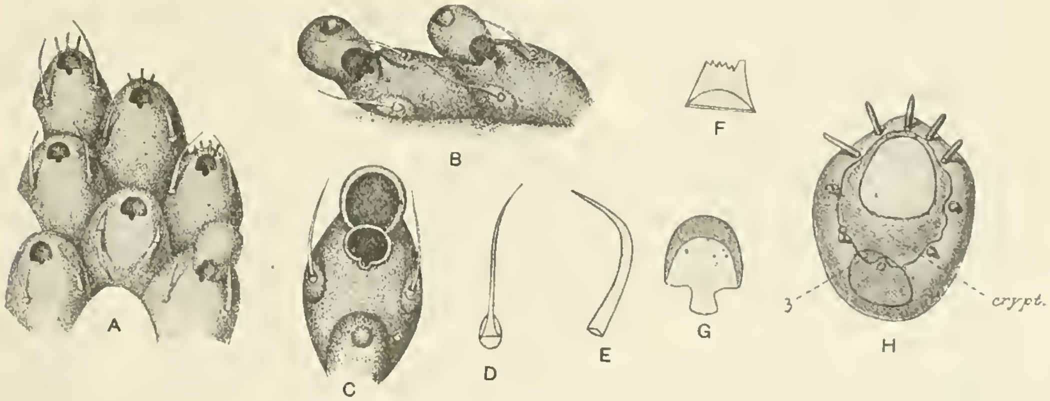


FIG. 16.—Genus *Schizolavella* Canu and Bassler, 1920.

A–H. *Schizolavella vulgaris* Moll, 1803. A. Portion of zoarium with an ovicelled zooecium × 25. B. Two zooecia, × 40, showing the umbonate ovicell and a mucro on the front wall. C. A zooecium, × 40, showing structure. D. Avicularian mandible. (A–D, after Hincks, 1880.) E. Avicularian mandible, × 85. F. Base of the avicularian mandible, × 250. G. Operculum, × 85. (E–G, after Waters, 1898.) H. Ancestrula. The region inside the marginal spines is partly occupied by a calcareous plate (*crypt*) which is probably a cryptocist; *b.* brown body (after Harmer, 1902).

Genus SCHIZOMAVELLA Canu and Bassler, 1920.

(For description see Bulletin 106, U. S. National Museum, p. 353.)

SCHIZOMAVELLA LONGIROSTRATA Hincks, 1883.

Plate 35, fig. 11.

1883. *Schizoporella longirostrata* HINCKS, Report on the Polyzoa of the Queen Charlotte Islands, Annals Magazine Natural History, ser. 5, vol. 11, p. 447, pl. 17, fig. 4 (not Robertson, 1908).

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.16 \text{ mm.} \\ la = 0.14 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.56 \text{ mm.} \\ lz = 0.36\text{–}0.40 \text{ mm.} \end{array}\right.$

Variations.—The rimule bears two salient condyles on which are supported the small proximal tongue of the operculum. The ovicell is globular, elongated, large; it bears in front a small concavity; it bears small tremopores like the frontal, it is closed by the operculum.

The large avicularium is not median; it is eccentric and curved.

The species which Miss Robertson has figured under the same name appears to be different for the apertura of the ovicelled zooecia is much larger than that of the ordinary zooecia. This is not the case in the figure of Hincks and of our specimen.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Habitat.—Queen Charlotte Islands.

Plesiotype.—Cat. No. 68572, U.S.N.M.

Genus GEMELLIPORELLA Canu and Bassler, 1920.

1920. *Gemelliporella* Canu and Bassler, North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 372.

The ovicell is hyperstomial and deeply embedded in the distal zooecium. The operculum does not close the ovicell and operates in a locella. The form of the apertura is like a keyhole. The frontal is garnished with lateral areolar pores and with a granular pleurocyst.

Genotype.—Gemelliporella vorax, new species. Range: Pliocene.

The genus *Gemellipora* Smitt, 1872, founded solely on the aspect of the apertura, is not a natural one. The first species described, *G. eburnea,* has been selected by Levinsen, 1909, as the type of the genus and classified in his family Liriozoidae. *Gemellipora striatula* Smitt, 1872, is a synonym for *Trypostega venusta* Norman, 1869. *Gemellipora glabra* Smitt appears to have a smooth frontal, but it is necessary to examine specimens anew. *G. limbata* Smitt is serial and appears to belong to the Phylactellidae. The keyhole form of the aperture does not appear to furnish a sufficient generic character because it does not correspond to an important modification of the hydrostatic function. In establishing the new genus *Gemelliporella* we have employed the characters furnished by the ovicell and the frontal.

GEMELLIPORELLA ASPER, new species.

Plate 18, figs. 5, 6.

Description.—The zoarium incrusts oysters. The zooecia are little distinct, irregularly elliptical; the frontal is small, hardly convex, surrounded by large, crowded, areolar pores. The apertura is deep, buried, elongate, shaped like a keyhole, with two lateral symmetrical condyles limiting the rimule; the peristomice is elliptical and bears a little salient mucro. The ovicell is globular, salient, punctate; its orifice is very large and can not be closed by the operculum. On each side of the apertura there are two large orbicular avicularia with pivot, *very salient;* the one between them is much developed and becomes onychocelliform; its pivot bears a wide rectangular denticle.

Measurements.—Apertura $\left\{\begin{matrix} ha = 0.14 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{matrix}\right.$ Zooecia $\left\{\begin{matrix} Lz = 0.40\text{–}0.50 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{matrix}\right.$

Affinities.—The avicularia by their saliency cover the zoarial surface with a great number of asperities which characterize this species, but which render it very irregular. The denticle placed on the pivot of the large avicularia is rather peculiar to this species, but it is not constant; it corresponds perhaps to a particular arrangement of the rachis. The known recent bryozoa never have this arrangement. The number and importance of the avicularia indicate calm waters.

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (very rare).

Cotypes.—Cat. Nos. 68573, 68574, U.S.N.M.

GEMELLIPORELLA VORAX, new species.

Plate 19, figs. 1–9.

Description.—The zoarium incrusts shells, oysters, and bryozoa. The zooecia are little distinct, separated by a furrow, irregularly elliptical; the frontal is convex, surrounded by some large areolar pores which are scattered and covered over with a pleurocyst more or less granular. The apertura is deep, oval, the point below with rimule wide and notched; the peristomice is semilunar with a proximal mucro more or less developed. The ovicell is convex, little salient, deeply embedded in the distal zooecium; its orifice is very wide and can not be closed by the operculum. On each side of the apertura there is a round avicularium; very frequently the one between them becomes very long and fusiform.

Measurements.—Apertura$\left\{\begin{array}{l} ha = 0.10 \text{ mm.} \\ la = 0.08 \text{ mm.} \end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz = 0.40 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{array}\right.$

Variations.—This species is exceedingly variable and takes the most fantastic aspects. The zooecia are only distinct on the small zoaria or on the margins of the large ones; at the center of the latter they are absolutely indistinct. The ancestrula is a small zooecium; it engenders two distal and four proximal zooecia. There are often interareolar costules. The reduction of its zooecial dimensions and the great development of the avicularia seems to indicate that this species required much oxygen.

It is remarkable that the species has disappeared from the recent Gulf of Mexico after its existence in the same region throughout the Miocene and Pliocene.

Occurrence.—Lower Miocene (Chipola marl): Chipola River, Calhoun County, Florida (rare). Miocene (Duplin marl): Wilmington and Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina (common); Muldrows Mills, 5 miles south of Maysville, South Carolina (rare). Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare). Miocene (Yorktown formation): Yorktown, 3 miles southwest of Petersburg, and other localities in Virginia (rare). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (common). Pliocene (Caloosahatchee marl): Shell Creek, De Soto County (rare), and Monroe County, Florida (common).

Cotypes.—Cat. Nos. 68575–68580, U.S.N.M.

GEMELLIPORELLA PUNCTATA Canu and Bassler, 1919.

Plate 5, figs. 7–9.

1919. *Gemelliporella punctata* CANU and BASSLER, Biology and Paleontology of the West Indies, Bryozoa. Publications of the Carnegie Institution of Washington, No. 291, p. 92, pl. 5, figs. 7–9.

Description.—The zoarium is free, cylindrical, bifurcated. The zooecia are very little distinct, elongate, convex; the frontal is granular and surrounded with areolar pores and is sometimes covered with *punctations* of pleurocystal origin. The aperture is oval, elongate, formed of a large semilunar anter and of a wide proximal sinus. The ovicell is deeply embedded in the distal zooecium, little salient, closed by the operculum, ornamented by an orbicular and very fragile frontal area.

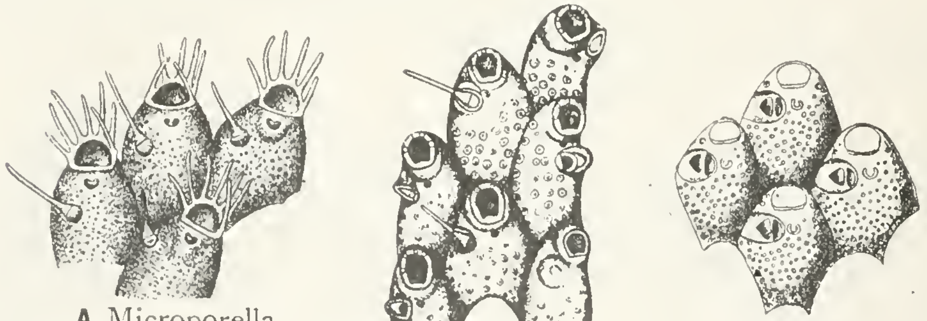
Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.15 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.60 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{array}\right.$

Affinities.—The punctations of the frontal are quite variable; there is not a single zooecium similar to another. In a better preserved state we think that each zooecium is surrounded with areolar pores irregular in size and spacing. The frontal is a thick and compact olocyst, covered by a pleurocyst which is granular or punctured with large pores which do not perforate the zooecial walls. Unfortunately we have not been able to confirm this exterior aspect by sections.

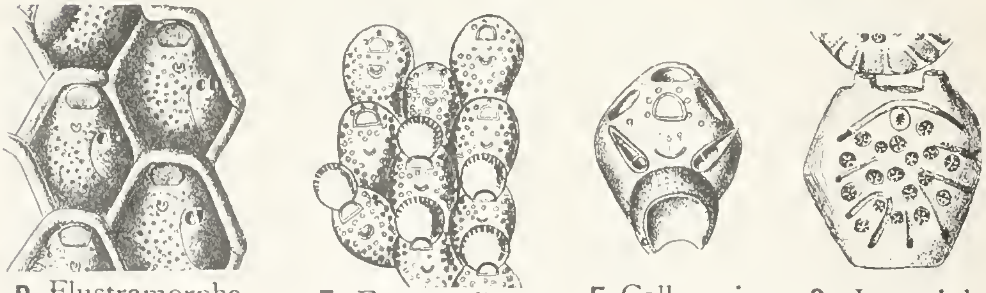
The possible relationship of this species to *Schizopodrella mutabilis* Canu and Bassler, 1919, has been mentioned under the discussion of that species.

Occurrence.—Lower Miocene (Bowden formation): Bowden, Jamaica (rare).

Cotypes.—Cat. No. 68581, U.S.N.M.



A. Microporella **B**. Diporula **C**. Ellipsopora



D. Flustramorpha **E**. Fenestrulina **F**. Calloporina **G**. Inversiula

FIG. 17.—Genera of the Microporellae.

A. *Microporella* Hincks, 1887; *M. ciliata* Pallas, 1766, × 43. B. Subgenus *Diporula* Hincks, 1880; *D. verrucosa* Peach, 1868, × 25. C. Subgenus *Ellipsopora*, new; *E. flabellaris* Busk, 1852, × 40. D. Subgenus *Flustramorpha* Gray, 1848; *F. marginata* Krause, × 40. E. *Fenestrulina* Jullien, 1888; *F. malusi* Savigny-Audouin, 1826, × 20. F. *Calloporina* Neviani, 1895; *C. decorata* Reuss. 1847, × 40. G. *Inversiula* Jullien, 1888; *I. inversa* Waters, 1889, × 50.

Group 2. MICROPORELLAE Canu and Bassler, 1917.

(See Bulletin 106, U. S. National Museum, p. 417, for description and illustration).

In this group the orifice of the compensatrix (frontal pore, micropore or ascopore) is distinct and removed from the apertura. The ovicell is hyperstomial and always closed by the operculum. Dietellae are present.

Historical.—The presence of a frontal micropore was considered by Hincks as an important family character, but the study of the larvae does not permit the adoption of his conclusion. According to Jullien, the ascopore is the orifice of a horn-shaped body, allowing the exterior to communicate with the tentacular sheath. Harmer and Levinsen believed that this was an optical illusion and that the ascopore was really the orifice of the compensatrix.

Levinsen, 1909, did not recognize the different genera established by authors according to the form of the apertura. We again follow the same principles of generic distinction by considering the great variations of the function of calcification. Many species considered at first to belong to the Microporellae have since been recognized as true representatives of the Adeonidae. According to the nature of the calcification and the form of the aperture, we class the following genera in this group:

Fenestrulina Jullien, 1888.
Microporella Hincks, 1877.
Calloporina Neviani, 1895.
?*Inversiula* Jullien, 1888.

Genus FENESTRULINA Jullien, 1888.

1888. *Fenestrulina* Jullien, Mission scientifique du Cap Horn, 1882-83, VI, Zoologie, Bryozoaires, p. 37.

The frontal is garnished with stellate tremopores. The operculum closes the ovicell. No avicularia. Fourteen to fifteen tentacles.

Genotype.—*Fenestrulina* (*Cellepora*) *malusi* Savigny-Audouin, 1826.

Range.—Helvetian-Recent.

The known species belonging to this genus are:

Fenestrulina (*Cellepora*) *malusi* Audouin, 1826.
Fenestrulina (*Microporella*) *proxima* Waters, 1904.
Fenestrulina (*Microporella*) *exigua* Waters, 1904.
Fenestrulina (*Microporella*) *parvipora* Waters, 1904.

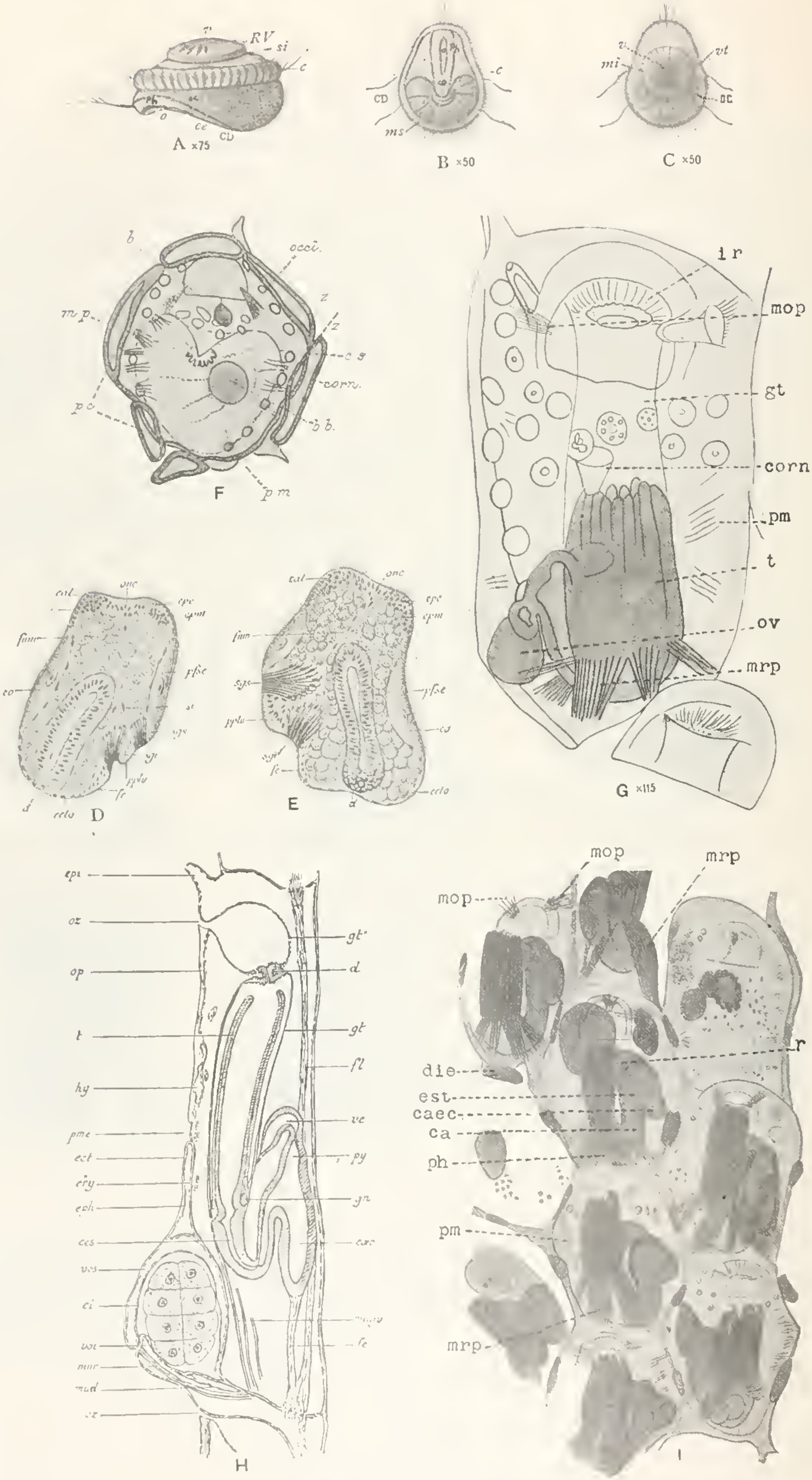

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FIG. 18.—Anatomy of the Microporellae.

FIG. 18.—Anatomy of the Microporellae.

A–D. *Microporella ciliata* Pallas, 1766. A. Profile view of free larva, × 75. B. Free larva, oral view, showing the large radiating elements of the oral mesoderm, × 50. C. Free larva, aboral view, showing radiating aspect of the calotte, 50. (A–C after Barrois, 1877.) c, corona; *cal*, calotte (terminal bud); *CD*, digestive cavity; *cc*, obscure part between the two branches of the stomach; *mi*, aboral mesoderm; *ms*, oral mesoderm; *O*, ciliated cleft; *oc*, oculiform points; *ph*, pharynx; *RV*, border of the calotte. D. Median sagittal section of an embryo in one of the last stages of development. (After Calvet, 1900.)

E–I. *Fenestrulina malusi* Audouin, 1826. E. Median sagittal section of an embryo just before it emerges. (After Calvet, 1900.) In the course of the neuro-muscular bundles passing from the central nerve organs to the pyriform organ some cellules are seen. The internal sack has a simple form almost regularly cylindrical. c, mantle; *cal*, calotte (terminal bud); *co*, corona; *d*, tampon or inner sac; *ecto*, ectoderm; *epc*, ectoderm thickening; *epm*, mesoderm thickening; *fc*, ciliated cleft; *fum*, neuro-muscular bundle; *onc*, central nervous organ of the embryo; *pfse*, sub-ectoderm nerve plexus; *pplv*, papilla of the vibratile plume; *si*, internal sac; *sqs*, superior glandular system; *sqi*, inferior glandular system. F. Basal view of a zooecium which has lost its polypide. (After Harmer, 1902.) *b*, polypide bud; *bb*, brown body; *corn*, cornicula; *cs*. compensatrix opening by the ascopore (*m. p.*); *occl*, operer muscles; *p. c.*, dietellae; *z*, neighboring zooecia. G. Anterior view of a zooecium containing only a young polypide, × 115. (after Jullien, 1888.) *ca*, cardiac region of the stomach; *caec*, caecum of the stomach; *corn*, cornicula; *die*, dietella; *est*, stomach; *gt*, tentacular sheath; *ir*, irisoid; *mop*, occlusor muscles of the operculum; *mrp*, large retractor muscles of the polypide; *ov*, ovary; *ph*, pharynx and esophagus; *pm*, parietal muscles; *r*, intestine and rectum; *t*, tentacles. H. Longitudinal section of a bryozoid. (After Calvet, 1900.) *caec*, stomachic caecum; *ci*, incubation cavity; *cry*, cryptocyst, or skeleton; *d*, diaphragm; *eph*, hypostegal epithelium; *epi*, spine; *fe*, central funicular cord; *fl*, lateral funicular cord; *gn*, nervous ganglion; *gt*, sub-diaphragm region of the tentacular sheath; *gt′*, subdiaphragm region; *hy*, hypostege; *mud*, dilator muscles of the incubation cavity; *mugr*, large retractor muscles; *mur*, retractor muscles of the frontal walls of the lower ovicellarian vesicle; *ocs*, esophagus; *op*, operculum; *oz*, zooecial orifice; *pme*, median frontal pore; *py*, pyloris; *re*, rectum; *t*, tentacles; *voi*, lower ovicellarian vesicle; *vos*, upper ovicellarian vesicle. I. Zoarium decalcified, seen posteriorly, × 45. (See G. for explanation of letters.)

FENESTRULINA MALUSI Savigny-Audouin, 1826.

Plate 36, figs. 2, 3.

1809. *Cellepora malusii* SAVIGNY, Description de l'Egypte, Polypes, pl. 8, fig. 8.

1826. *Cellepora malusii* AUDOUIN, Explication des planches de Savigny, p. 239.

1862. *Cellepora californiensis* GABB and HORN, Monograph of the fossil Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy Natural Sciences Philadelphia, ser. 2, vol. 5, p. 130, pl. 19, fig. 12.

1895. *Microporella malusi* MACGILLIVRAY, Monograph of the Tertiary Polyzoa of Victoria, Transactions Royal Society of Victoria, vol. 4, p. 65, pl. 9, fig. 1 (regional bibliography).

1895. *Microporella (Fenestrulina) malusi* NEVIANI, Briozoi fossili delle Farnesina, Palaeontographia Italica, vol. 1, p. 104 (sep. 28).

1895–1896. *Microporella (Fenestrulina) malusi* NEVIANI, Briozoi neozoici, di alcune localitia d'Italia, Bollettino della Societa Romana per gli Studi Zoologici, pt. 1, p. 115 (sep. 7); pt. 2, p. 229 (sep. 5); pt. 3, p. 109 (sep. 8).

1898. *Microporella malusi* DE ANGELIS, Los primeros antozoos y briozoos miocenicos recogidos en Cataluña, p. 22.

1901. *Microporella (Fenestrulina) malusi* NEVIANI, Briozoi neogenici della Calabric, Palaeontographia italica, vol. 6, p. 175 (sep. 61) (Regional bibliography).

1904. *Microporella malusi* CANU, Les Bryozoaires du Patagonien, Memoires de la Societe geologique de France, vol. 12, No. 33, p. 11, pl. 3, fig. 27.

1905. *Microporella (Fenestrulina) malusi* NEVIANI, Bryozoi fossili de Carrubare (Calabrio), Bollettino delle Societa geologica italiana, vol. 23, p. 524, fig. 8.

1907. *Microporella malusi* CALVET, Expeditions scientifiques du *Travailleur* et du *Talisman*, p. 404 (bibliography).

1908. *Microporella malusi* CANU, Bryozoaires fossiles de l'Argentine, Anales del Museo Nacional de Buenos Aires, vol. 16, p. 280.

1908. *Microporella malusi* Robertson, The incrusting cheilostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 4, no. 5, p. 282, pl. 18, figs. 35, 36.

1909. *Fenestrulina malusi* Norman, The Polyzoa of Madeira, Journal Linnean Society, Zoology, vol. 30, p. 297.

1910. *Microporella malusi* Waters, Reports on the marine biology of the Sudanese Red Sea, Journal Linnean Society of London, Zoology, vol. 32, p. 168.

1912. *Microporella malusi* Barroso, Briozoos de la estacion maritima de Sautander, Trabajos del Museo de ciencias naturales, no. 5, p. 27.

It is remarkable that this very cosmopolitan species has never been observed in the western Atlantic, fossil as well as recent.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.08\text{–}0.10\text{mm.} \\ la=0.16\text{–}0.18\text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{mm.} \\ lz=0.36\text{ mm.}\end{array}\right.$

Occurrence.—Pleistocene: Santa Barbara (common), and Dead Mans Island, off San Pedro, California (very rare).

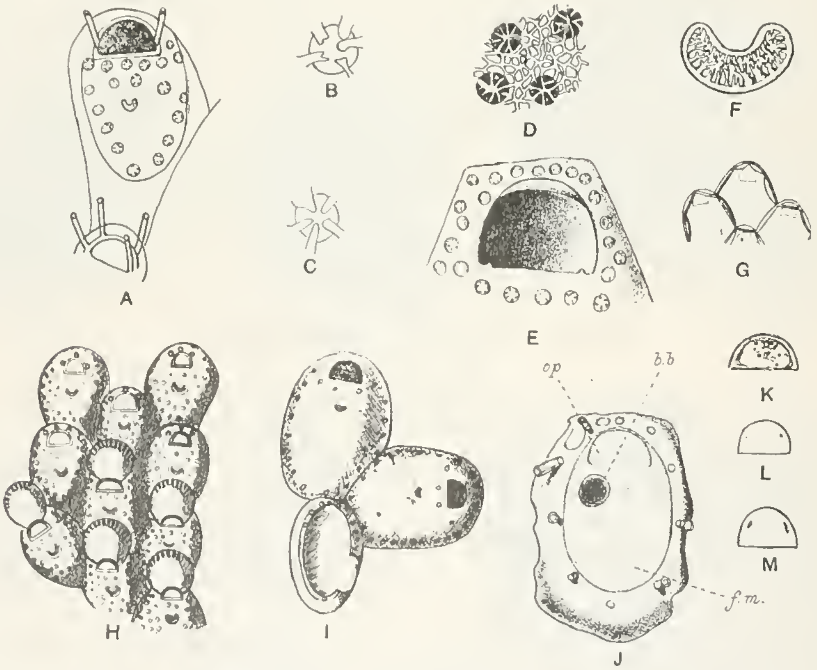


Fig. 19.—Genus *Fenestrulina* Jullien, 1888.

A–J. *Fenestrulina malusi* Savigny Audouin, 1826. A. A zooecium × 50 showing all the characters. B, C. Stellate frontal pores, × 250. (A–C, after Waters, 1903.) D. Portion of surface of a zooecium, × 175. E. Aperture, × 100. (After Levinsen, 1909.) F. Detailed structure of the ascopore (fenestrule of Jullien) × 175. G. Dorsal face of the zooecia, showing the dietellae × 18. H. Zooecia × 21, several showing the ovicell. (D, F–H, after Levinsen, 1894.) I. Ancestrula and ancestrular zooecia, × 25. J. Ancestrula. The frontal membrane is typically Flustrine, its calcareous margin bearing ten spines, of which three are oral spines; *op*, operculum; *b. b.*, brown body; *f. m.*, frontal membrane (=ectocyst). (After Harmer, 1902.)

K. Operculum, × 85. (After Waters, 1877.) L. *Fenestrulina parvipora* Waters, 1903. Operculum, × 85. M. *Fenestrulina proxima* Waters, 1903. Operculum, × 85. (I, L, M, after Waters, 1903

Geological distribution.—Burdigalian of Catalogne (De Angelis); Patagonian of Argentina (Canu); Miocene of Australia (MacGillivray) and New Zealand (Waters); Plaisancian of England (Busk) and of Italy (Manzoni); Astian of Italy (Seguenza); Sicilian of Italy (Seguenza, Neviani); Quaternary of Italy (Seguenza, Neviani).

Habitat.—Arctic Ocean: Finmark (16–48 meters). North Sea: Norway, Denmark (29–45 meters), England. Eastern Atlantic: England, English Channel, Gulf of Gascony (10–180 meters), Madeira. Mediterranean: Cette, Corse, Naples, Oran. Adriatic (32–89 meters). Southern Atlantic: Tristan da Cunha (228–243 meters), Falkland Islands (8–34 meters). Eastern Pacific: Queen Charlotte Islands, California (32–48 meters). Southern Pacific: Tahiti, Australia (5–13 meters), New Zealand. Western Pacific: Japan, Cape Tizard (China Sea) (44 meters), Indian Ocean, Red Sea. Antartic Ocean: Cape Horn (5–300 meters), Malouines Islands, Terra del Fuego.

Plesiotypes.—Cat. No. 68582, U.S.N.M.

FENESTRULINA POROSA, new species.

Plate 37, fig. 4.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, very little elongated; the surface is convex, very *porous* and perforated in its middle portion by a crescentric ascopore. The apertura is semilunar, transverse, surrounded by a little salient, very thin peristome. The ovicell is globular, covered with scarcely visible tuberosities and surrounded by a salient ring.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.13 \text{ mm.} \\ la=0.26 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.65 \text{ mm.} \\ lz=0.50\text{–}0.65 \text{ mm.} \end{array}\right.$

Affinities.—The peristome frequently bears two spines. The frontal is often covered with a double pellicule.

This species is very close to *Fenestrulina malusi*, but differs from it in its greater number of frontal pores and in its triple instead of double rows of pores present between the aperture and the ascopore.

Occurrence.—Pleistocene: Santa Monica (Long Wharf Canyon), California (rare).

Holotype.—Cat. No. 68583, U.S.N.M.

Genus MICROPORELLA Hincks, 1877.

1877. *Microporella* Hincks, On British Polyzoa, Annals Magazine Natural History, ser. 4, vol. 20, p. 526.

The operculum closes the ovicell and is semielliptical. The frontal is an ordinary tremocyst. Avicularia are present. Thirteen to fourteen tentacles.

Genotype.—*Microporella* (*Eschara*) *ciliata* Linnaeus, 1759.

Range.—Miocene-Recent.

Under this well-known genus we recognize three subgenera, as follows:

Diporula Hincks, 1879, characterized by a horseshoe-shaped orifice, slightly contracted by two lateral projections.

Ellipsopora, new subgenus, characterized by a transverse, elliptical apertura.

Flustramorpha Busk, 1884, characterized by the presence of radicular fibers and vibracula.

The known species belonging to this genus and its subgenera are as follows:

Microporella ciliata Linnaeus, 1759.
Microporella flabelligera Levinsen, 1909.
Microporella divaricata Waters, 1903.
Microporella hyadesi Jullien, 1888.
Microporella personata Busk, 1852.
Microporella rudis McGillivray, 1895.
Microporella rugosa Maplestone, 1900.
Microporella marginata Maplestone, 1909.
Microporella coronata Audouin, 1896.
Microporella (*Flustramorpha*) *marginata* Krauss, 1837.
Microporella (*Diporula*) *verrucosa* Peach, 1868.
Microporella (*Diporula*) *hastigera* Busk, 1884.
Microporella (*Ellipsopora*) *flabellaris* Busk, 1852.

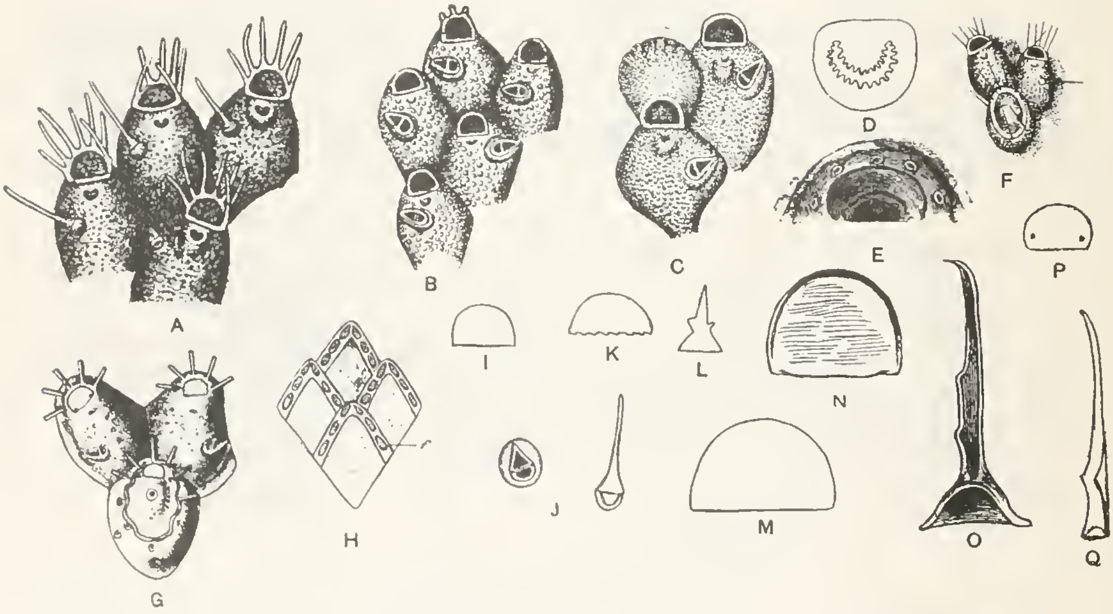


Fig. 20.—Genus *Microporella* Hincks, 1877.

A–I. *Microporella ciliata* Pallas, 1766. A. Zooecia with spines and mandible, × 43. B. Zooecia with avicularia, × 29. C. Ovicelled zooecia, × 40. E. Aperture, × 200. F. Ancestrula and ancestrular zooecia, × 29. (A–C, after Hincks, 1880.) G. The same part of the zoarium, × 55. (E, F, after Levinsen, 1909.) H. Zooecia from the basal surface, × 26, showing the dietellae. (After Levinsen, 1894.) I. J, Opercula and mandibles. (After Waters, 1877, and Hincks, 1880.)

D. Structure of the ascopore of *Microporella hyadesi* Jullien, 1888.

K–Q. Opercula and mandibles. K, L. *Microporella hyadesi* Jullien, 1888. (After Waters, 1877.) M. *Microporella divaricata* Canu, 1902. (After Waters, 1903.) N, O. *Microporella personata* Busk, 1852. (After Busk, 1885.) P, Q. *Microporella coronata* Audouin, 1826. (After Waters, 1909.)

MICROPORELLA CILIATA Linnaeus, 1759.

Plate 20, figs. 1–6; plate 36, figs. 4, 5.

1759. *Cellepora ciliata* Linnaeus, Systema Naturae, ed. 12, p. 1286.
1889. *Microporella ciliata* Jelly, A synonymic catalogue of marine Bryozoa, p. 179 (bibliography).
1891. *Microporella ciliata* Neviani, Briozoi postpliocenici di Livorno, Bollettino della Societa geologica italiana, vol. 10, p. 117 (sep. 21).
1895. *Microporella* (*Fenestrulina*) *ciliata* Neviani, Briozoi fossili della Farnesina Palaeontographia italica, vol. 1, p. 105 (sep. 29), pl. 5, fig. 25.
1895–1900. *Microporella* (*Fenestrulina*) *ciliata* Neviani, Briozoi neozoici di alcune localita d'Italia, Bollettino della Societa Romana per gli Studi Zoologici, pt. 1, vol. 4, p. 7; pt. 2, vol. 4, p. 234 (sep.10); pt. 3, vol. 5, p. 122 (sep. 21); pt. 5, vol. 7, pp. 13, 15; pt. 6, vol. 8, p. 3, 9, 10.
1896. *Microporella* (*Fenestrulina*) *ciliata* Neviani, Briozoi postpliocenici di Spilinga, Atti Academia Gioenia di Scienze Naturali in Catania, vol. 9, p. 22.
1900. *Microporella* (*Fenestrulina*) *ciliata* Neviani, Briozoi neogenici della Calabrie, Palaeontographia italica, vol. 6, p. 176 (sep. 62) (regional bibliography).
1900. *Microporella* (*Fenestrulina*) *ciliata* Neviani, Briozoi terziari et posterziari della Toscana, Bollettino della Societa geologica italiana, vol. 19, p. 368 (sep. 19).
1904. *Microporella inflata* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 416, pl. 110, fig. 7.
1904. *Microporella praeciliata* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 415, pl. 110, fig. 6, pl. 113, fig. 3.
1905. *Microporella* (*Fenestrulina*) *ciliata* Neviani, Briozoi fossili di Carrubare (Calabria), Bollettino della Societa geologica italiana, vol. 23, p. 324 (sep. 22).
1907. *Microporella ciliata* Calvet, Expeditions scientifiques du *Travailleur* et du *Talisman*, p. 403, (regional bibliography).
1908. *Microporella ciliata* Waters, The Bryozoa of the Sudanese Red Sea, Journal Linnean Society, London, vol. 31, p. 143.
1911. *Microporella ciliata* Guerin-Ganivet, Bryozoaires provenant de la Rade de Brest, Travaux du Laboratoire de Zoologie de Concarneau, p. 2.
1912. *Microporella ciliata* Guerin-Ganivet, Contributions a l'etude des Bryozoaires des côtes armoricaines, III, Travaux scientifiques du Laboratorie de Zoologie de Concarneau, p. 12.
1912. *Microporella ciliata* Osburn, Bryozoa of Woods Hole Region, Bulletin Bureau of Fisheries, vol. 30, p. 233, pl. 24, fig. 44; pl. 30, fig. 90.
1912. *Microporella ciliata* Barroso, Briozoos de la estacion de biologia maritima de Santander, Trabajos del museo de ciencias naturales, p. 26.
1912. *Microporella ciliata* Osburn, Bryozoa from Labrador, Newfoundland, and Nova Scotia, Proceedings U. S. National Museum, vol. 43, p. 279.
1913. *Microporella ciliata* Guerin-Ganivet, Bryozoaires de la mission arctique commandee par Ch. Bénard, Société d'oceanographie du Golfe de Gascogne, vol. 7, p. 23.
1913. *Microporella ciliata* Canu, Contribution a l'etude des Bryozoaires fossiles, IV, Pliocene d'Alger, Bulletin Société Geologique France, vol. 13, p. 125.
1915. *Microporella ciliata* Barroso, Contribucion al conocimiento de los Briozoos marinos de España, Boletin de la Sociedad española de Historia natural, vol: 15, p. 414.
1915. *Microporella ciliata* Waters, Marine biology of the Sudanese Red Sea, Journal Linnean Society, London, vol. 31, p. 443.
1917. *Microporella ciliata* Barroso, Notas sobre Briozoos, Boletin de la R. Sociedad española de Historia natural, vol. 17, p. 4.

The great variations in the calcification of the frontal in this species have been known for a long time. They have been carefully noted by the zoologists and depend solely on the nature of the water and the age of the zoarium. When the granulations are important, the tremopores appear very small and even may disappear leaving the frontal smooth (forma *inflata*). If the granulations are little developed, the tremopores appear large (forma *praeciliata*). A specimen from Carteret County, North Carolina, is very suggestive. The incrusting portion shows normal zooecia with granulations and tremopores (fig. 1); a bilamellar expansion shows, on the contrary, zooecia without granulations but with large tremopores (fig. 2). A specimen from Santa Barbara, California, has very small avicularia as in *Microporella umbonata*, but nevertheless its dimensions are absolutely identical with *Microporella ciliata*.

Measurements.—Apertura $\begin{cases} ha = 0.04\text{–}0.06 \text{ mm.} \\ la = 0.10\text{–}0.12 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{cases}$

The coast of California is the Elysium of the genus *Microporella*, for a wealth of species occurs there. They are very closely related and their determination is not made without difficulty because of their polymorphism. It is necessary especially to take into consideration the reciprocal place occupied by the avicularium and the ascopore; the micrometric measurements are of value only in extreme cases.

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklockonee River, 25 miles southwest of Tallahassee, Florida (rare). Miocene (St. Mary's formation): Cove Point, Maryland (rare). Miocene; Kuhns, Carteret County, North Carolina (rare). Miocene (Choptank formation); Jones Wharf, Maryland (rare). Pleistocene: Santa Monica (rare); Dead Mans Island, off San Pedro (rare); and Santa Barbara, California (rare).

Geological distribution.—Stampian of Germany (Schreiber); Chatian of Germany (Reuss); Miocene of Australia (Waters), of Tunis (Canu); Burdigalian of Gard in France (Canu collection); Helvetian of Italy (Seguenza Neviani), of France (Canu collection); Tortonian of Italy (Seguenza), of Austria-Hungary (Reuss); Sahelian of Oran (Canu collection); Zanclean of Italy (Seguenza); Pliocene of New Zealand (Waters); Plaisancian of Algeria (Canu), of Italy (Manzoni), of England (Busk); Astian of Italy (Seguenza); Sicilian of Italy (Seguenza, Manzoni, Neviani), of Rhodes (Manzoni); Quaternary of Italy (Waters, Seguenza, Neviani, De Stefani).

Habitat.—Cosmopolitan.

Plesiotypes.—Cat. Nos. 68584–68590, U.S.N.M.

MICROPORELLA HEXAGONA, new species.

Plate 20, figs. 14, 15.

Description.—The zoarium incrusts shells. The zooecia are little distinct, separated by a furrow, short, *hexagonal*, convex, gibbose; the frontal is convex, irregular, and formed of a tremocyst with large pores detachable from a subjacent, finely perforated olocyst. The apertura is deeply buried, semilunar; the peristome is somewhat salient, very thin, and bears four to six large, hollow spines. The ovicell is little salient and is covered by an incomplete tremocyst. The ascopore is large and is surrounded by a very salient peristome. There are two small avicularia or a single one very large and salient.

Measurements.—Apertura $\begin{cases} ha = 0.07 \text{ mm.} \\ la = 0.12\text{–}0.15 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.45\text{–}0.50 \text{ mm.} \\ lz = 0.45 \text{ mm.} \end{cases}$

Affinities.—The intensity of the calcification is remarkable in this species and gives to it an aspect very characteristic and difficult to figure. The large avicularium is triangular, the beak pointing upward; the pivot is almost always broken. The distal border of the apertura is often denticulated by the rupture of the hollow spines much wider than the peristome. In spite of its double protective envelope the ovicell is often broken. The exterior aspect is absolutely unique. This species must have lived in a strong current.

Occurrence.—Miocene (Duplin marl): Darlington Courthouse, South Carolina (rare).

Holotype.—Cat. No. 68591, U.S.N.M.

MICROPORELLA BIFOLIATA Ulrich and Bassler, 1904.

Plate 20, figs. 7–11.

1904. *Microporella*? *bifoliata* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 417, pl. 113, figs. 6–8.

The original description is as follows:

> Zoarium erect, bifoliate, not known to branch. Zooecia subquadrate or hexagonal, arranged in regular longitudinal and diagonally intersecting series, four longitudinally and five diagonally in 2 mm. Appearance of surface varying with age. In young examples the zooecia are more or less convex and separated, especially transversely, by an impressed line containing one or more rows of pores; the orifice is somewhat transverse and subovate with the proximal side straightened, the peristome but little elevated, the front sparsely punctated, the avicularia of which there is usually one to each zoöecium placed some distance beneath and to one side of the orifice, rather large, subcircular and divided into two nearly equal parts by a thin partition. In old examples the oral part is sunken and the rest of the surface abundantly punctate, while the avicularia have been somewhat reduced in size. Immediately behind the orifice there is always a small (? peristomial) pore. Ovicells large, rather strongly convex, punctate.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.11 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.55 \text{ mm.} \\ lz = 0.25\text{–}0.35 \text{ mm.} \end{array}\right.$

We have nothing to add to the original description except to call attention to the fact that the ascopore is crescent shaped.

This species differ from *Microporella ciliata* Linnaeus, 1759, in the absence of frontal granules, in the presence of larger tremopores and in its nontransverse aperture which is almost as high as wide. The erect form of the zoarium is rather rare in the genus *Microporella* and it appears to form a good character for this species. Nevertheless we have observed bilamellar expansions in *Microporella ciliata*.

Occurrence.—Miocene (Choptank formation): Cordova, Maryland (rare).

Cotypes.—Cat. No. 68592, U.S.N.M.

MICROPORELLA FISSURIFERA, new species.

Plate 19, figs. 12–13.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, elliptical, little elongated, wide; the frontal is convex and perforated by a large number of tremopores. The apertura is semilunar, transverse; it is surrounded by a thin peristome bearing four large spines. The ascopore is placed on a median prominence of the frontal. The avicularium is short, triangular, without pivot, with its beak turned toward the top. The dietellae are not entirely covered over, and appear between the zooecia in the form of small *slits*. The ovicell is large, globular, buried in the distal zooecium, covered with a tremocyst.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.10 \text{ mm.} \\ la = 0.10\text{–}0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.60 \text{ mm.} \\ lz = 0.50 \text{ mm.} \end{array}\right.$

Variations.—In this genus, where the species are so difficult of determination, the present species is very well characterized by the dietellae not entirely covered over by the tremocyst. We are ignorant as to the cause of this remarkable peculiarity, which has been observed hitherto only in the Membraniporae. The distal diatellae are visible on the marginal zooecia. The two proximal spines are always larger and more salient than the distal spines. Our micrometric measurements are those of the larger zooecia for the variations are considerable.

Occurrence.—Miocene (Yorktown): Near Macedonia Church, Essex County, (very rare); 1 mile northeast of Suffolk, 3 miles southwest of Petersburg, and other localities in Virginia. Miocene (Duplin marl): 10 miles south of Greenville, North Carolina (rare).

Cotypes.—Cat. Nos. 68593, 68594, U.S.N.M.

MICROPORELLA TESSELLATA Tuomey and Holmes, 1857.

Plate 30, figs. 2, 3.

1857. *Cellepora tesselata* Tuomey and Holmes, Pliocene fossils of South Carolina, p. 13, pl. 4, fig. 7.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.06 \text{ mm.} \\ la = 0.11 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.75 \text{ mm.} \\ lz = 0.60 \text{ mm.} \end{array}\right.$

Variations.—There are often six very short and very inconstant spines. The vestibular arch is always visible. The apertura is relatively small for so large a species, which appears to indicate extremely fine tentacles. The frontal is perforated with rather large tremopores. The ascopore is surrounded by a salient peristome. In the vicinity of the ancestrula the avicularium is small and placed at the level of the ascopore. The large marginal zooecia have their avicularia larger and placed in the wider part of the zooecium well below the ascopore. This character is quite visible on the figure of Tuomey and Holmes and we believe that it is sufficient to recognize this long-forgotten species of these American authors. There are six lateral and one distal dietellae.

Affinities.—This species differs from *Microporella eustomata* Gabb and Horn, 1862, and from *Microporella vibraculifera* Hincks, 1883, in its smaller avicularium, more distant from the zooecial axis and of a more irregular position. It differs from *Microporella ciliata* Linnaeus, 1759, in the large zooecial dimensions and its larger avicularium.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, and Giles Bluff, Peedee River, South Carolina (Tuomey and Holmes).

Pleisotypes.—Cat. No. 68595, U.S.N.M.

MICROPORELLA UMBONATA Hincks, 1882.

Plate 36, figs. 6, 7.

1882. *Microporella ciliata* forma *umbonata* Hincks, Report on the Polyzoa of the Queen Charlotte Islands, Annals and Magazine of Natural History, ser. 5, vol. 2, p. 15, pl. 17, fig. 1.

Measurements.—Apertura $\begin{cases} ha = 0.08 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.52\text{–}0.60 \text{ mm.} \\ lz = 0.30\text{–}0.40 \text{ mm.} \end{cases}$

Variations.—There is one small oral avicularium (rarely two). The frontal is a tremocyst with small pores. The ovicell is costulated. The frontal gibbosity (umbo) is always placed below the ascopore. Our specimens bear no spines.

Affinities.—This species differs from *Microporella ciliata* Linnaens, 1759, in the presence of the frontal umbo and in its larger micrometric dimensions. It differs from *Microporella fallax* Canu, 1904 from the post-Pampean of Argentina, which also bears a frontal gibbosity, in its avicularium which is placed not much below the ascopore but always at the same level with it.

Occurrence.—Pleistocene: Santa Monica (rare), Santa Barbara (very rare), and Dead Mans Island, off San Pedro (very rare), California.

Habitat.—Queen Charlotte Islands.

Plesiotype.—Cat. No. 68596, U.S.N.M.

MICROPORELLA CALIFORNICA Hincks, 1883.

Plate 36, figs. 8–10.

1858. *Lepralia californica* Busk, Zoophytology, Quarterly Journal Microscopical Science, vol. 4, p. 310, pl. 11, fig. 6.

1883. *Microporella ciliata* forma *californica* Hincks, Report on the Polyzoa of the Queen Charoltte Islands, Annals and Magazine Natural History, ser. 5, vol. 2, p. 444, pl. 17, fig. 3.

1908. *Microporella californica* Robertson, The incrusting chilostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 4, No. 5, p. 281, pl. 18, figs. 32–34.

Measurements.—Apertura $\begin{cases} ha = 0.07 \text{ mm.} \\ la = 0.13 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.80 \text{ mm.} \\ lz = 0.40\text{–}0.46 \text{ mm.} \end{cases}$

Variations.—Our specimens are somewhat larger than those living to-day off the coast of California. There are six spines but on our fossils only two, three, or four alone persist. The frontal is a tremocyst with large pores superposed on an olocyst perforated by very small corresponding pores; it is detachable.

The two avicularia are rather constant erect, rather long, very sharp, with a very fragile pivot; their slender beak is easily broken. In some cases one avicularium is smaller than the other. There is a salient frontal gibbosity bearing the ascopore or placed below it. The ascopore is surrounded by a smooth peristome.

Hincks, 1883, thought that his specimens belonged to Busk's species, 1856. Waters, 1908, affirmed that Busk's species is *Microporella coronata* Savigny-Audouin, 1826.

Affinities.—This species much resembles *Microporella coronata* Savigny-Audouin, 1826, in its costulate ovicell; it differs from it in the presence of six spines (and not four) and in its larger avicularia. It differs from *Microporella ciliata* Linnaeus, 1759, in the constant presence of two large avicularia, and in its frontal with large tremopores.

Occurrence.—Pleistocene: Santa Monica (Long Wharf Canyon) (rare), Santa Barbara (common), and San Pedro (rare), California.

Habitat.—Queen Charlotte Islands and coast of California.

Plesiotypes.—Cat. Nos. 68597, 68598, U.S.N.M.

MICROPORELLA VIBRACULIFERA Hincks, 1883.

Plate 36, figs. 11, 12.

1883. *Microporella ciliata* forma *vibraculifera* HINCKS, Report on the Polyzoa of the Queen Charlotte Islands, Annals and Magazine of Natural History, ser. 5, vol. 11, p. 15, pl. 17, fig. 2.

1890. *Microporella ciliata*, var. *vibraculifera* ORTMANN, Die japanische Bryozoen-Fauna, Archiv für Naturgeschichte, vol. 50, pt. 1, p. 38, pl. 3, fig. 5.

Measurements.—Apertura $\begin{cases} ha = 0.06 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50\text{–}0.60 \text{ mm.} \\ lz = 0.34\text{–}0.40 \text{ mm.} \end{cases}$

Variations.—There are six large hollow spines. The ovicell and the frontal bear large tremopores. The avicularium is large, salient, tuberous, placed laterally and lower than the ascopore; the mandible is placed transversally. The ovicell is costulate. The organ originally called vibraculum by Hincks is in reality an avicularium with very long and setiform mandible. There is often a pivot.

Affinities.—This species differs from *Microporella ciliata* Linnaeus, 1759, in the presence of six large hollow spines and in larger micrometric measurements. It differs from *Microporella fallax* Canu, 1904, in its larger avicularium placed very near the ascopore. It differs from *Microporella eustomata* Gabb and Horn, 1862, in its transverse avicularium.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon) (rare), Dead Mans Island off San Pedro (rare), and Santa Barbara (very rare), California.

Habitat.—Queen Charlotte Islands and Japan (113–405 meters).

Plesiotypes.—Cat. Nos. 68599,68600, U.S.N.M.

MICROPORELLA EUSTOMATA Gabb and Horn, 1862.

Plate 36, fig. 13.

1862. *Reptoporina eustomata* GABB and HORN, Monograph of the fossil Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy of Natural Sciences of Philadelphia, ser. 2, vol. 5, p. 144, pl. 20, fig. 26.

Measurements.—Apertura $\begin{cases} ha = 0.06 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.60\text{–}0.80 \text{ mm.} \\ lz = 0.50 \text{ mm.} \end{cases}$

Affinities.—Gabb and Horn's figure is very characteristic; the mandible of the avicularium is oblique in relation to the zooecial median axis so that the whole avicularium convexity appears bent toward this same axis. This is the exact case in our specimens. However, they bear only six large hollow spines instead of eight shown on the figures of the American authors. The frontal and the ovicell are garnished with large tremopores. The ovicell is preceded by a sort of tubular turret, at the base of which is buried the operculum. The avicularium is curved and always has a pivot.

This species differs from *Microporella vibraculifera* Hincks, 1883, in its oblique and nontransverse avicularium. It differs from all the other species of *Microporella* in its large avicularium.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon) (rare) and Santa Barbara, California (Gabb and Horn).

Plesiotype.—Cat. No. 68601, U.S.N.M.

MICROPORELLA HEERMANNI Gabb and Horn, 1862.

Plate 37, figs. 1, 2.

1862. *Repteschardlina heermanni* Gabb and Horn, Monograph of fossil Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy Natural Sciences of Philadelphia, ser. 2, vol. 5, p. 147, pl. 20, fig. 30.

Description.—The zoarium incrusts shells. The zooecia are large, elliptical, swollen, separated by a furrow, convex; the frontal is formed by a granular tremocyst perforated by numerous small pores. The apertura is semilunar, transverse; the peristome is thin, somewhat salient, deprived of spines resistant to fossilization.

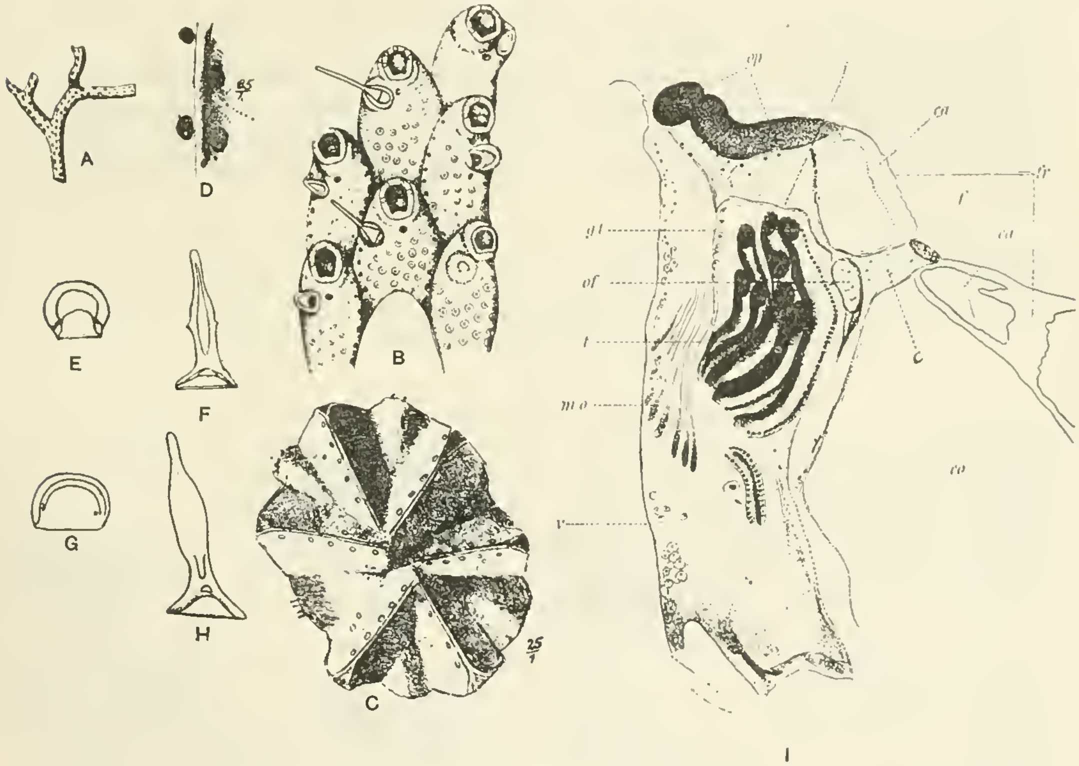


Fig. 21.—Subgenus *Diporula* Hincks, 1879.

A–F. *Diporula verrucosa* Peach, 1868. A. Zoarium, natural size. B. Zooecia with avicularia and mandibles, × 25. (A, B, after Hincks, 1880.) C, D. Growing extremity of a zoarium. The ends of the last formed row of zooecia have a double slope, like the roof of a house with a raised, rounded, slightly overlapping ridge at the top. On each side of this are usually five tubular holes and one or two lower down on the side. At the bottom of these tubes is a membrane which has one, two, or even more minute perforations. D shows the ridge of the roof and rosette pores, × 85. E. Operculum, × 85. (C–E, after Waters, 1878.) F. Mandible, × 85. (After Waters, 1885.)

G–I. *Diporula hastigera* Busk, 1884. G. Operculum, × 85. H. Mandible, × 85. (After Waters, 1889.) I. Section of zooecium showing anatomical structure. (After Jullien, 1903.) *ar*, avicularium; *c*, corniculum; *ca*, calcite; *co*, compensatrix; *f*, fenestrule (=ascopore); *fr*, frontal; *gt*, tentacular sheath; *i*, irisoid; *mo*, opercular muscles; *of*, inferior orifice of the corniculum; *op*, operculum; *t*, tentacles; *v*, dorsal. The corniculum is not a tube allowing communication of the ascopore with the tentacular sheath as Jullien thought, but it is a simple fold of the compensatrix probably determined by the size of the tentacles.

The ovicell is globular, placed on the distal zooecium, and of the same nature as the frontal. One or two small triangular oblique avicularia are located on each side of the ascopore.

Measurements.—Apertura $\begin{cases} ha = 0.10 \text{ mm.} \\ la = 0.16 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.70\text{–}1.00 \text{ mm.} \\ lz = 0.50\text{–}0.60 \text{ mm.} \end{cases}$

Affinities.—This large species is well characterized. It differs from *Microporella californica* Hincks, 1883, in its smaller tremopores, its avicularia twice as short, its granular frontal, and its larger dimensions. The vestibular arch is as large as in *Microporella ciliata* Linnaeus, 1759; it differs from it in its micrometric measurements, which are twice as large ($Lz = 1.00$ mm. and not 0.50 mm.). It differs from *Microporella gibbera* in the regular form of its zooecia and in its small avicularia placed at the level of the ascopore.

Although we have not found this species at Santa Barbara, Gabb and Horn's type locality, we do not hesitate to compare our specimens with *Reptescharella heermanni* Gabb and Horn. Their figure resembles *Microporella ciliata* Linnaeus, 1759, as much as it does the present one, but we believe it best to adopt their name instead of suggesting a new one.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon) (rare), and Santa Barbara, California (Gabb and Horn).

Plesiotype.—Cat. No. 68602, U.S.N.M.

MICROPORELLA GIBBERA, new species.

Plate 37, fig. 3.

Description.—The zoarium is unilamellar. The zooecia are distinct, separated by a furrow, very irregular, *gibbose;* the frontal is convex and perforated by numerous and rather large spines. The apertura is semilunar, transverse; the peristome is thin, a little salient, deprived of spines, resistant to fossilization. The ascopore is very small and placed in the immediate vicinity of the apertura. The ovicell is large, very globular, irregular, of the same nature as the frontal. The two avicularia are very small and placed lower than the ascopore.

Measurements.—Apertura $\begin{cases} ha = 0.12 \text{ mm.} \\ la = 0.14\text{–}0.16 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.90\text{–}1.00 \text{ mm.} \\ lz = 0.60 \text{ mm.} \end{cases}$

Affinities.—The two avicularia are not constant; there is often only a single one, somewhat a little larger. The form of the zooecia defies description.

This species differs from *Microporella heermanni* Gabb and Horn, 1862, in which the dimensions are close, in the irregularity of its zooecia and in its small avicularia placed below the ascopore.

Occurrence.—Pleistocene: Rustic Canyon, Santa Monica, California (very rare).

Holotype.—Cat. No. 68603, U.S.N.M.

Subgenus DIPORULA Hincks, 1879.

1879. *Diporula* HINCKS, On the classification of the British Polyzoa, Annals and Magazine Natural History, ser. 5, vol. 3, p. 156.

The operculum is semilunar and closes the ovicell. The frontal is a tremocyst. Avicularia are present. The apertura is horseshoe shaped and is slightly contracted by two lateral projections. The concavity of the ascopore is denticulated.

Genotype.—*Diporula* (*Eschara*) *verrucosa* Peach, 1873.

Range.—Pliocene-Recent.

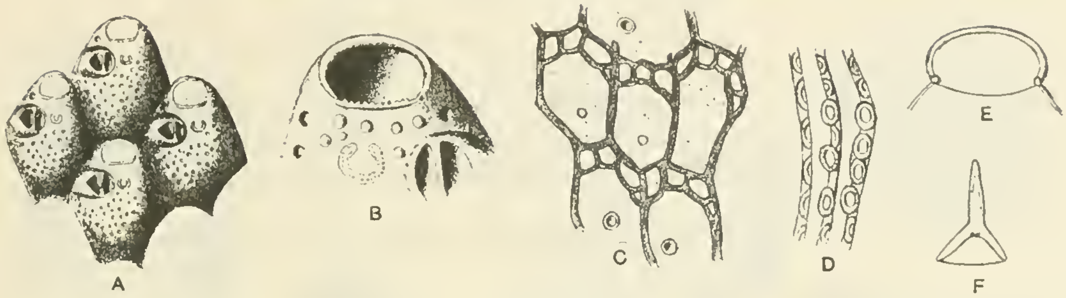


FIG. 22.—Subgenus *Ellipsopora*, new.

A–F. *Ellipsopora* (*Microporella*) *flabellaris* Busk, 1852. A. Zooecia with avicularia, × 40. B. The distal end of a zooecium, × 100. C. Zooecia from the basal surface, × 40. Besides the basal wall of the dietellae, the small triangular basal surface of the vibracular chamber is seen lowest down to the right on the four zooecia. On some zooecia the basal surface shows a septula and on others an opening corresponding with a septula in an opposite zooecium. D. Radical fibers, × 140. E. Operculum, × 140. F. Mandible, × 55. (A–F, after Levinsen, 1909.)

ELLIPSOPORA, new subgenus.

The aperture is transverse, elliptical. The operculum is elliptical and closes the ovicell. The frontal is a tremocyst. There is a vibraculum on each zooecium.

Genotype.—Ellipsopora (*Eschara*) *flabellaris* Busk, 1852. Recent.

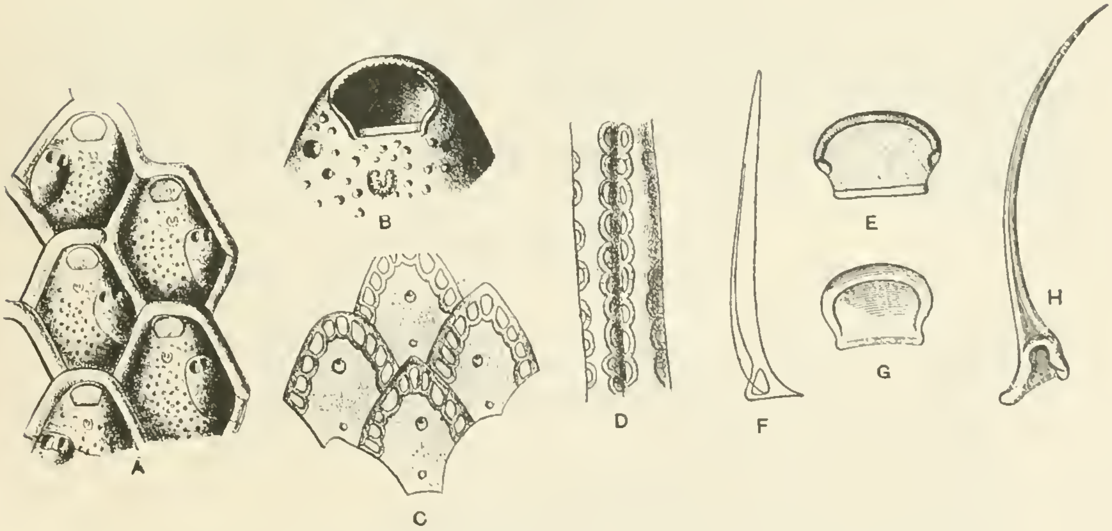


FIG. 23.—Subgenus *Flustramorpha* Gray, 1848.

A–H. *Flustramorpha marginata* Krauss, 1837. A. Zooecia with their avicularium, × 40. B. The distal end of a zooecium, × 100. C. Four zooecia, from the basal surface, × 40. In addition to the marginal dietellae, each basal zooecial surface shows a rosette plate (=septula) and an opening for communication with zooecia in the opposite layer. D. Radical fibers, × 40. E. Operculum, × 140. F. Avicularian mandible, × 55. (A–F, after Levinson, 1909.) G, H. Operculum and mandible. (After Busk, 1885.)

Subgenus FLUSTRAMORPHA Gray, 1848.

1848. *Flustramorpha* Gray, List of British Animals in British Museum, pt. 1, Centroniae or Radiated animals.

The operculum closes the ovicell; it is trapezoid. The zoarium is chitinous. "Zoarium erect, radiate, bilaminar, composed of irregular lobes, bordered and loosely connected by chitinous tubes; mouth coarctate; a lateral pouch-like vibracularium." (Busk.)

Genotype.—Flustramorpha (Flustra) marginata Krauss, 1837. Recent.

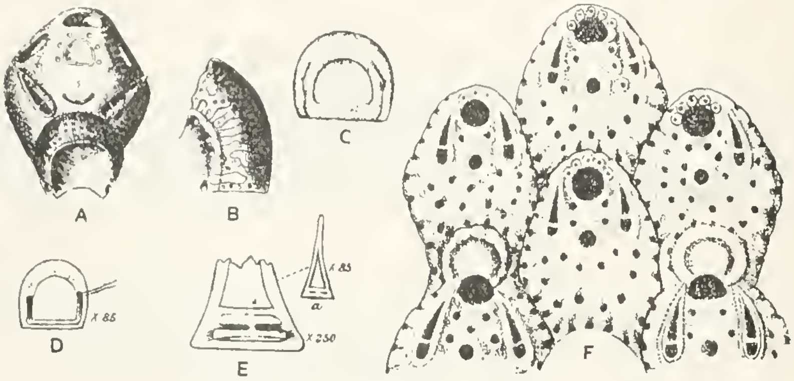


Fig. 24.—Genus *Calloporina* Neviani, 1895.

A–F. *Calloporina decorata* Reuss, 1847. A. The zooecium is furnished with three distal dietellae, and the curved belts on the ovicell, at the base of which are seen the fine pores of the endooecium, are canal like cavities between the endooecium and the distal calcified part of the ectooecium. Between these canals, which open through a circle of pores, the two layers of the zooecium have united; × 40. B. A portion of the zooecium, magnified × 75. C. Operculum, × 100. (A–C, after Levinsen, 1909.) D. Operculum, × 85. E. Mandible, × 85. (D, E, after Waters, 1887.) F. Portion of a fossil zoarium. (After Manzoni, 1875.)

Genus **CALLOPORINA** Neviani, 1895.

1895. *Calloporina* Neviani, Briozoi fossili della Farnesina e Monte Maria presso Roma Paleontographia Italica, Pisa, vol. 1, p. 107.

The frontal is garnished with lateral areolar pores. Costules and avicularia are present. The ascopore is circular.

Genotype.—Calloporina (Cellepora) decorata Reuss, 1847.

Range.—Helvetian-Recent.

The known species of the genus are:

Calloporina (Cellepora) decorata Reuss, 1847.
Calloporina (Lepralia) diadema MacGillivray, 1868.
Calloporina (Microporella) renipuncta MacGillivray, 1882.
Calloporina (Microporella) scandens MacGillivray, 1884.

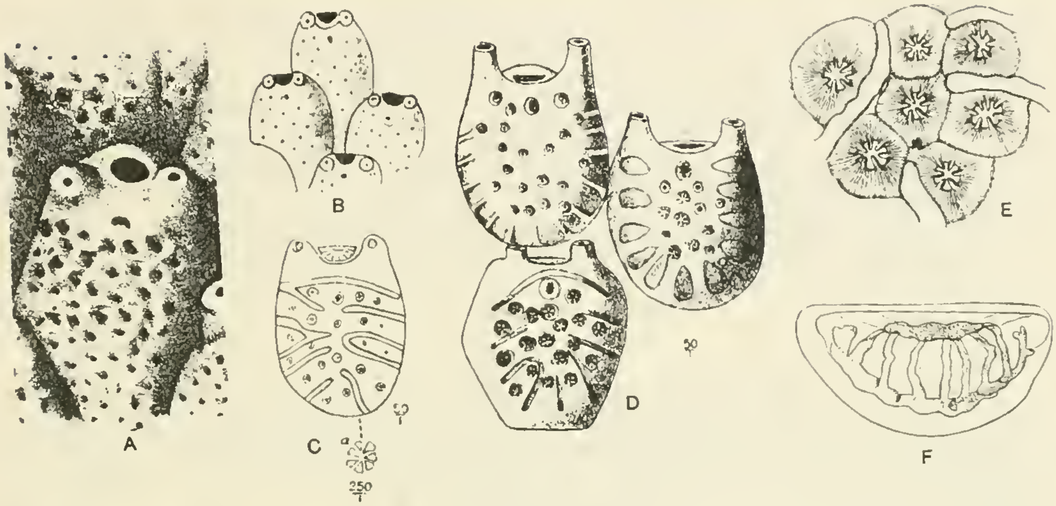


Fig. 25.—Genus *Inversiula* Jullien, 1888.

A. *Inversiula nutrix* Jullien, 1888. Zooecium. (After Jullien, 1888.)

B–F. *Inversiula inversa* Waters, 1889. B. Zooecia, × 25. C. Decalcified zooecia, × 50. Distinct tubes occupy the place of the grooves. The interior membrane of the zooecial wall is not perforated by the stellate pores. A stellate pore × 250 is represented at *a*. D. Three stages of growth, × 50. There are deep grooves between the stellate pores. (B–D, after Waters, 1889.) E. Structure of the stellate pores, × 200. (After Levinsen, 1909.) F. Operculum, × 250. (After Waters, 1887.)

Genus **INVERSIULA** Jullien, 1888.

1888. *Inversiula* Jullien, Mission scientifique du Cap Horn. 1882–83, VI, Zoologie, Bryozoaires, p. 41.

No ovicell. The frontal is a tremocyst with stellate pores. The aperture is elliptical and transverse. The convexity of the ascopore is turned toward the aperture. Avicularia are present. No spines.

Genotype.—*Inversiula nutrix* Jullien, 1888.

Range.—Miocene-Recent.

The known species of this genus are:

Inversiula nutrix Jullien, 1888.
Inversiula (*Microporella*) *inversa* Waters, 1889.
Inversiula (*Microporella*) *airensis* Maplestone, 1910.
Inversiula (*Microporella*) *quadricornis* Maplestone, 1910.

Group 3. **HIPPOPORAE** Canu and Bassler, 1917.

Genus **HIPPOPORINA** Neviani, 1895.

(For description see Bulletin 106, U. S. National Museum, p. 374.)

HIPPOPORINA PUSILLA, new species.

Plate 45, figs. 8, 9.

Description.—The zoarium incrusts sponges and corals. The zooecia are distinct, separated by a furrow, small, elongate, elliptical; the frontal is an absolutely smooth olocyst. The apertura is very small, surrounded by a thick peristome which is salient tuberous, or garnished with six spines; two very small cardelles placed on the lower third separate the anter from the concave poster. The ovicell is globular, salient; it can not be closed by the operculum.

Measurements.—Apertura $\begin{cases} ha=0.07. \\ la=0.05 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz=0.40 \text{ mm.} \\ lz=0.25 \text{ mm.} \end{cases}$

Affinities.—The saliency of its peristome and its small dimensions characterize this species quite well.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (very rare).

Holotype.—Cat. No. 68604, U.S.N.M.

HIPPOPORINA GIBBOSA, new species.

Plate 18, fig. 10.

Descriptions.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow of little depth, hexagonal, elongate; the frontal is smooth, little convex, garnished with a frontal *gibbosity.* The apertura is elongate and formed of a large anter separated by two cardelles from a small poster with proximal border almost straight. The ovicell is large globular, widely open.

Measurements.—Apertura $\begin{cases} ha=0.14 \text{ mm.} \\ la=0.11 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz=0.45\text{–}0.50 \text{ mm.} \\ lz=0.30\text{–}0.35 \text{ mm.} \end{cases}$

Variations.—No other known species of the genus *Hippoporina* presents a frontal gibbosity; it is therefore easy to distinguish this one and no error is possible. The micrometric measurements of the zooecia are quite variable and our figure shows a zooecium measuring 0.60 mm. in width. This irregularity is difficult to explain, for it is not occasioned only by calcification; it is real and easy to ascertain on the worn zooecia whose frontal is broken. In most of the other Cheilostomatous bryozoa the irregularity is more apparent than real and examination of the interiors reveals the zooecia to be practically equal.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (rare).

Holotype.—Cat. No. 68605, U.S.N.M.

HIPPOPORINA(?) VESTITA, new species.

Plate 18, figs. 7–9.

Description.—The zoarium incrusts oysters. The zooecia are distinct, hexagonal, separated by a furrow of little depth, with little convex frontal, smooth and covered by two or three superposed calcareous *pellicles.* The apertura is elliptical, elongate. The ovicell is little salient; it bears a very fragile frontal area.

Variation.—This is a strange species, the generic position of which is very uncertain; but we are unable to create a special genus for such incomplete specimens. The latter bear only broken ovicells and we can not obtain an exact idea of their nature. The exterior calcification is very remarkable. The deposit of two or three calcareous pellicles can only be explained by an endocystal covering, immediately adjacent to the ectocyst.

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare).

Holotype.—Cat. No. 68606, U.S.N.M.

HIPPOPORINA LATA(?) Smitt, 1872.

Plate 1, fig. 11.

1872. *Gemellipora lata* Smitt, Floridan Bryozoa, pt. 2, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, No. 4, p. 36, pl. 7, fig. 157.

1919. *Hippoporina lata* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution at Washington, No. 291, p. 93, pl. 1, fig. 14.

This recent species was described from specimens from the Floridan waters and the species itself is confined to this region. A very mediocre fossil specimen of doubtful determination has been found in the strata of Antigua.

Occurrence.—Oligocene (Antigua formation): Rifle Butts, Antigua, Leeward Islands (rare).

Plesiotype.—Cat. No. 68607, U.S.N.M.

Genus HIPPODIPLOSIA Canu, 1916.

(For description see Bulletin 106, U. S. National Museum, p. 393.)

HIPPODIPLOSIA BACCATA Canu and Bassler, 1920.

Plate 3, fig. 1.

1920. *Hippodiplosia baccata* Canu and Bassler, Monograph of the Early Tertiary Bryozoa of North America, Bulletin 106, U. S. National Museum, p. 397, pl. 87, figs. 5, 6.

This species, which was based on specimens from the Vicksburgian of Mississippi, is represented in Lower Miocene strata at Bowden, Jamaica. In these Miocene specimens the tremocyst is separable and the intensity of the calcification is very active in the ancestrular region.

Occurrence.—Miocene (Bowden marl): Bowden, Jamaica (rare).

Geologic distribution.—Vicksburgian of Mississippi.

Plesiotype.—Cat. No. 68608, U.S.N.M.

HIPPODIPLOSIA BIGIBERRA, new species.

Plate 12, fig. 10.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow, elongated, subrectangular; the frontal is somewhat convex, perforated by a dozen of small tremopores and ornamented with two *gibbosites* symmetrically placed in the vicinity of the apertura, which they hide and partially deform. The apertura is elliptical, elongated; two small, deep cardelles separate a large anter from a small poster.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.17\text{–}0.19 \text{ mm.} \\ la = 0.15\text{–}0.17 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.50 \text{ mm.} \\ lz = 0.35\text{–}0.45 \text{ mm.} \end{array}\right.$

Structure.—The aspect of the apertura is very deceiving in a photograph. It appears to resemble that of *Gemellipora*, but this is an optical illusion arising from the projection on the same plane of the different zooecial elevations. In reality the apertura is elliptical, but its proximal portion is deformed by two frontal gibbosites which appear thus separated by a false rimule. By inclining specimens the true form of the apertura is visible.

Occurrence.—Miocene (Yorktown formation): 3 miles southwest of Petersburg, Virginia (rare).

Holotype.—Cat. No. 68609, U.S.N.M.

Genus HIPPOMENELLA Canu and Bassler, 1917.

(For description see Bulletin 106, U. S. National Museum, p. 379.)

HIPPOMENELLA INFRATELUM Canu and Bassler, 1919.

Plate 6, fig. 2.

1919. *Hippomenella infratelum* Canu and Bassler, Geology and Paleontology of the West Indies Bryozoa, Publications of the Carnegie Institution of Washington, No. 291, p. 92, pl. 6, fig. 2.

Description.—The zoarium is a narrow Eschara borne on an expanded base. The zooecia are elongate, distinct, elliptical; the frontal is convex, surrounded by a line of small areolar pores and formed of a pleurocyst very finely granulated. The apertura is elliptical, elongate, with two very small cardelles. The avicularium is salient, elliptical with pivot, placed on the line of pores in the *lower* part of the zooecium.

Measurements.—Apertura $\begin{cases} ha = 0.16\text{–}0.20 \text{ mm.} \\ la = 0.14 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.60\text{–}0.70 \text{ mm.} \\ lz = 0.40\text{–}0.50 \text{ mm.} \end{cases}$

Affinities.—The only specimen found has been figured. The species is absolutely characterized by its elliptical avicularium placed inferiorly, a character which does not exist in the other species of the genus. We have observed a rather rare case of regeneration of a zooecium by an avicularium (*zr*).

Occurrence.—Lower Miocene (Bowden marl): Cercado de Mao, Santo Domingo (very rare).

Holotype.—Cat. No. 68610, U.S.N.M.

Genus HIPPOPORELLA Canu and Bassler, 1920.

(For description see Bulletin 106, U. S. National Museum, p. 377.)

HIPPOPORELLA SPINOSA, new species.

Plate 19, fig. 10.

Description.—The zoarium incrusts other bryozoa. The zooecia are distinct, separated by a deep furrow, somewhat elongate, elliptical; the frontal is smooth, very convex, garnished laterally with small areolar widely spaced pores. The apertura is elongate, the proximal border is almost straight; the two small cardelles are placed very low; the peristome is little salient and bears six spines. There is a vestibular arch. The ovicell is large, globular, salient, never closed by the operculum.

Measurements.—Apertura $\begin{cases} ha = 0.12 \text{ mm.} \\ la = 0.10\text{–}0.12 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50 \text{ mm.} \\ lz = 0.35 \text{ mm.} \end{cases}$

Variations.—The zooecia are rather variable in aspect and measurements; however, the number of spines, the vestibular arch, and the place of the cardelles are very constant characters which permit no confusion with the species which we have described from the American Eocene.

Occurrence.—Miocene (Yorktown): Yorktown, Virginia (rare).

Holotype.—Cat. No. 68611, U.S.N.M.

HIPPOPORELLA(?) PAPULIFERA, new species.

Plate 19, fig. 14.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, elongated, elliptical; the frontal is very convex, perforated by a double row of areolar pores, ornamented with little salient costules and covered by a more or less granular pleurocyst. The apertura is oblique, deep, located at the base of a peristomie, the peristome of which is spinous, very thin and little salient; the two cardelles are quite low. A hollow mucro in the form of a *pimple* hides the proximal part of the apertura.

Measurements.—Apertura$\left\{\begin{array}{l} ha=0.15 \text{ mm.}\\ la=0.15 \text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.45\text{–}0.50 \text{ mm.}\\ lz=0.35\text{–}0.40 \text{ mm.}\end{array}\right.$

Affinities.—We have not discovered the ovicell of this species. The frontal granulations are rare or numerous according to the place of the zooecia. On account of the obliquity of the aperture the two cardelles are visible only when the specimen is inclined to an angle of 45°.

This species differs from *Lepralia montifera* Ulrich and Bassler, 1904, in its nontransverse aperture and from *Hippoporella costulata* in the absence of small adventitious avicularia.

Occurrence.—Miocene (Choctowhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (very rare).

Holotype.—Cat. No. 68612, U.S.N.M.

HIPPOPORELLA COSTULATA, new species.

Plate 45, fig. 14.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, hexagonal, widened; the frontal is convex and formed of an olocyst surmounted by a pleurocyst garnished laterally with areolar pores and with costules converging toward the oral mucro. The apertura bears two very small cardelles placed in the lower third; the proximal border is somewhat concave and denticulated. The ovicell is globular, smooth, little salient, much embedded in the distal zooecium; it is never closed by the operculum. On the line of pores there are small irregularly placed avicularia.

Measurements.—Apertura$\left\{\begin{array}{l} ha=0.12 \text{ mm.}\\ la=0.12 \text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.45\text{–}0.50 \text{ mm.}\\ lz=0.35\text{–}0.45 \text{ mm.}\end{array}\right.$

Variations.—The line of areolar pores is often doubled by another more interior one. The passage of the eggs, as in all the species of this genus, is assured by the embedding of the ovicell in the distal zooecium and in the presence of the oral mucro formed by the coalescence of the interareolar costules. In the vicinity of the ancestrula the zooecia have some large frontal pores. The species has neither peristome nor spines.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (very rare).

Holotype.—Cat. No. 68613, U.S.N.M.

Genus LEPRALIA Johnston, 1847.

The name *Lepralia* is retained for those species of the Hippoporae which show no ovicell and which cannot therefore be more definitely placed.

LEPRALIA MONTIFERA Ulrich and Bassler, 1904.

Plate 18, fig. 11.

1904. *Lepralia montifera* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 424, pl. 116, fig. 5.

The original description is as follows:

> Zoarium parasitic, in one or more layers. Zooecia not regularly arranged, subovate, averaging 0.5 mm. or a trifle more in length and about 0.35 mm. in width. Orifice oblique, depressed in front, transversely subovate, broadly sinuate below; peristone scarcely thickened. Central portion of surface very high, the slopes traversed by rows of large punctures in radially disposed furrows. Ovicells not observed; nor avicularia, unless certain elongate-acuminate, curved depressions, with a pore at the broader lower extermity, that sometimes may be observed close to the rim of the orifice, are of that nature. This rather highly ornamented form reminds in certain respects of *Cribrilina*, but on the whole it agrees better with *Lepralia*. The strikingly monticular elevation and strongly puncto-radiate marking of the surface of the zooecia will, we believe, serve very well in distinguishing the species.

We are unable to classify this species generically on account of the absence of ovicell on the type and only specimen.

The interareolar costules are larger than in *Hippoporella costulata*, but the present species differs in the absence of a hollow infraoral mucro and of the small adventitious avicularia.

Occurrence.—Miocene (St Mary's formation): St. Marys River, Maryland (very rare).

Holotype.—Cat. No. 68614, U.S.N.M.

LEPRALIA CRIBROSA? Maplestone, 1900.

Plate 36, fig. 1.

1900. *Lepralia cribrosa* Maplestone, Further descriptions of the Tertiary Polyzoa of Victoria, pt. 6, Proceedings Royal Society, Victoria, vol 13, pt. 2, p. 210, pl. 35, fig. 16.

We are not certain of our determination, although the specimen studied is a superb one. If the magnification indicated by Maplestone be exact our species would be somewhat smaller. The absence of an ovicell does not allow the species to be classified generically. Two very small cardelles separate a large anter from a smaller poster.

Occurrence.—Pleistocene: Santa Monica, (Long wharf Canyon), California (very rare).

Geological distribution.—Miocene of Australia (Maplestone).

Plesiotype.—Cat. No. 68615, U.S.N.M.

Group 4. PERISTOMELLAE Canu and Bassler, 1917.

Genus TRYPEMATELLA Canu and Bassler, 1920.

1920. *Trypematella* Canu and Bassler, Monograph North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 417.

The ovicell is hyperstomial and closed by the operculum for the passage of the eggs. The apertura is semilunar with proximal border a little concave. The frontal bears some lateral areolar pores (pleurocyst on olocyst). Two large lateral avicularia are placed below the apertura.

Genotype.—*Trypematella papulifera*, new species. Pleistocene.

TRYPEMATELLA PAPULIFERA, new species.

Plate 35, figs. 12–14.

Description.—The zoarium is free and cylindrical; it incrusts fine algae. The zooecia are little distinct, short, wide; the frontal is little convex and perforated laterally by large areolar pores. The apertura is semielliptical; the peristome is salient and very thin with four distal spines; the ovicell is very large, placed on the distal zooecium, globular, salient, closed by the operculum for the passage of the eggs; it is costulate and granulated and bears a smooth *prominence* at its summit. On each side of the apertura there is a small round avicularium without pivot. Laterally, on the line of the areolar pores, on each side of the zoecium, there is a large triangular avicularium, with pivot, transverse or turned toward the top.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.09 \text{ mm.} \\ la=0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.40\text{–}0.45 \text{ mm.} \\ lz=0.30\text{–}0.45 \text{ mm.} \end{array}\right.$
(With the avicularia.)

Variations.—This fine species is very irregular in aspect on account of the irregularities of calcification. This is very active and gives a great thickness to the zoöecial walls. The size and number of the avicularia, the organs of oxygenation, seem to indicate that the species lived in very calm waters.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (rare).

Cotypes.—Cat. No. 68616, U.S.N.M.

Group 5. DIVERS GENERA.

Genus CYCLOCOLPOSA Canu and Bassler, 1920.

1920. *Cyclocolposa* Canu and Bassler, Monograph North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 431.

The apertura is suborbicular or elliptical without cardelles. The frontal is an olocyst, perforated by a double row of areolar pores, and covered by a granular, detachable pleurocyst. The ovicell is hyperstomial, never closed by the operculum, embedded in the distal zooecium.

Genotype.—*Cyclocolposa perforata*, new species.

Range.—Miocene-Pliocene.

In spite of appearances this genus is very different from *Cyclicopora* Hincks, 1884. The frontal pores are really areolar pores and not tremopores, for they are separated by short costules; the granulations reveal also the detachable pleurocyst, moreover, and are often visible on the altered zooecia. In *Cyclicopora* the operculum always closes the ovicell to assure the passage of the eggs; here this function is assured by the embedding of the ovicell in the distal zooecium, and in the great thickness of the frontal; the orifice is thus arranged in the locella in front of the tentacular sheath.

CYCLOCOLPOSA PERFORATA, new species.

Plate 30, figs. 6–14.

Description.—The zoarium incrusts oysters over large surfaces. The zooecia are distinct, separated by a furrow, elliptical or hexagonal, short, wide; the frontal is convex, surrounded by a double row of areolar pores, and formed of an olocyst supporting a granular and detachable pleurocyst. The apertura is oblique, suborbicular, deeply embedded. The ovicell is globular, smooth, little salient, deeply embedded in the distal zooecium. The walls are very thick and perforated by a large number of dietellae. The ancestrula is small and reduced to only the apertura; it emits five zooecia.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.17 \text{ mm.} \\ la=0.17 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{–}0.55 \text{ mm.} \\ lz=0.50 \text{ mm.} \end{array}\right.$

Variations.—The pleurocyst is detachable by alteration during fossilization (fig. 10). The ancestrula, normal in figure 8, is often covered by the pleurocyst of the adjacent zooecia (fig. 9). Sometimes there are nonoriented zooecia. The calcified zooecia are provided with tremopores. The structure of the olocyst is that of *Cyclicopora*. The very thick walls with numerous dietellae characterize this species (fig. 14); their number is quite variable from 12 to 20.

Mucronella laqueata Norman, 1864, presents the same dietellae; it differs from it in its perforated frontal and in the absence of lyrule.

Occurrence. Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (very common).

Cotypes.—Cat. No. 68617, U.S.N.M.

CYCLOCOLPOSA TENUIPARIETIS, new species.

Plate 21, figs. 1–4.

Description.—The zoarium incrusts pelecypod shells. The zooecia are distinct, elongated, elliptical, separated by a deep furrow; the frontal is convex, surrounded by a double row of large, scattered, areolar pores, separated by pleurocystal granules. The apertura is elongate, oblique, elliptical, without cardelles. The ovicell is small, hardly salient, much embedded in the distal zooecium, with frontal smooth and fragile. Rarely a round oral avicularium is present.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.16 \text{ mm.} \\ la=0.14 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.54\text{–}0.58 \text{ mm.} \\ lz=0.46\text{–}0.50 \text{ mm.} \end{array}\right.$

Affinities.—The presence of the ovicell absolutely disfigures this species; isolated portions of the zoarium containing only ovicelled zooecia can not be determined with certainty. The fragility of the superior wall is extreme; it does not resist fossilization; it results in a fantastic aspect difficult to comprehend. Exteriorly the pleurocyst is much reduced, and the abundance of areolar pores seems to indicate a tremocyst; the study of the interior does not permit this supposition.

This species differs from *Cyclocolposa perforata* in its elongate zooecia and in its very thin zooecial walls.

Occurrence.—Miocene (Duplin marl): Harvey Mills, Leon County, Florida (rare).

Cotypes.—Cat. No. 68618, U.S.N.M.

CYCLOCOLPOSA(?) SPINIFERA, new species.

Plate 20, figs. 12, 13.

Description.—The zoarium incrusts oysters. The zooecia are distinct, separated by a deep furrow, somewhat elongated, much swollen; the frontal is very convex, garnished laterally with a double row of areolar pores and formed of an olocyst supporting a detachable pleurocyst. The apertura is orbicular or somewhat elongated and is surrounded by six large hollow *spines*. The ovicell is hyperstomial, very globular, smooth, costulated on its borders; it is closed by the operculum. A very small median avicularium opens in the apertura.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.15 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.50 \text{ mm.} \\ lz = 0.35 \text{ mm.} \end{array}\right.$

Variations.—The exterior aspect of this species is rather variable. Figure 12 represents the young zoarium which has not had time to attain its complete development. The apertura appears as elliptical and elongated; the frontal is still not completely covered by the pleurocyst and the deposit of calcite is clearly visible around each areolar pore. In figure 13 the calcification is complete; the frontal is very thick and the form of the apertura here becomes undefinable. The small median avicularium appears to be excavated in the thickness of the pleurocyst.

Occurrence.—Miocene (Yorktown formation): 1 mile west of Fort Nonsense, Gloucester County (rare), Beulahland, King and Queen County, and other localities in Virginia (rare).

Cotypes.—Cat. No. 68619, U.S.N.M.

Genus CYCLOPERIELLA Canu and Bassler, 1920.

1920. *Cycloperiella* Canu and Bassler, Monograph North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 43.

The ovicell is hyperstomial, globular, not embedded in the distal zoecium, and entirely covers the apertura. The apertura is formed of a semilunar anter and of a very concave poster. The frontal is formed of a very thin olocyst supporting a tremocyst with large widened pores.

Genotype.—*Cycloperiella rubra*, new species.

Range.—Miocene-Pliocene.

This genus offers the same frontal and apertural characters as *Cyclicopora* Hincks, 1884. It differs from it in its ovicell never closed by the operculum. The passage of the eggs is assured by the form of the ovicell itself, which entirely covers the apertura.

CYCLOPERIELLA RUBRA, new species.

Plate 21, figs. 5–9.

Description.—The zoarium incrusts shells and frequently presents two superposed lamellae. The zooecia are elongate, a little elliptical, separated by a deep furrow; the frontal is thick, convex, and covered with large, widened tremopores. The apertura is semilunar, with a concave proximal border, and surrounded by a sort of thick and little salient peristome. The ovicell is globular, salient, covered with tremopores; it entirely covers the apertura. Its exterior orifice is irregular.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.15 \text{ mm.} \\ la = 0.15 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.55\text{–}0.60 \text{ mm.} \\ lz = 0.35 \text{ mm.} \end{array}\right.$

Affinities.—The zoarium often covers large surfaces; it was strongly pigmented, all the fossils are purple, indicating that their primitive tint was red. In the interior the very thin and pellicular olocyst scarcely resists fossilization, and the tremopores are clearly visible. Two very small lateral condyles serve as axis to the operculum. The orifice of the ovicell is irregular, oblique to the zooecial surface. It is difficult to comprehend how the polypide could extend its tentacles.

It is therefore probable that after the passage of the eggs the polypide disappears by histolysis. The zooecia with calcified orifice are not rare. Sometimes a small gibbosity occurs on the frontal.

Occurrence.—Miocene (Duplin marl): Wilmington, 8 miles east of Snow Hill, 10 miles south of Greenville, and Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina (common). Miocene (Yorktown formation): Suffolk, 3 miles southwest of Petersburg, and other localities in Virginia (common). Miocene (Bowden marl): Bowden, Jamaica (rare). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (common).

Cotypes.—Cat. Nos. 68620–68625, U.S.N.M.

Genus CYCLICOPORA Hincks, 1884.

(For description, see Bulletin 106, U. S. National Museum, p. 424.)

CYCLICOPORA MULTILAMELLOSA, new species.

Plate 46, figs. 3–6.

Description.—The zoarium is free, irregularly orbicular, striated concentrically on the inferior face and formed of many superposed lamellae. The zooecia are heaped upon each other, little raised, nonoriented, distinct, elongated, hexagonal or rectangular; the frontal is little convex, tuberous, and formed of a tremocyst with scattered pores, resting on an olocyst. The apertura is elliptical, transverse, with a concave proximal border; it is placed at one of the zooecial angles. In the immediate vicinity of the apertura there is a small orbicular avicularium sometimes transformed into a long transverse avicularium. The ovicell is globular, salient, very large, partially embedded in the distal zooecium and always closed by the operculum; it is covered by the tremocyst.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.15 \text{ mm.} \\ la = 0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.80 \text{ mm.} \\ lz = 0.60\text{–}0.80 \text{ mm.} \end{array}\right.$

Variations.—The zooecial dimensions are quite variable; the zooecia are elongated or transverse. The characteristic of this species is the excentric position of the apertura; this and the avicularium occupy the distal portion of the zooecium. In the interior the aperture occupies its usual median position; it is therefore the irregularities of calcification which causes its exterior aspect.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (rare).

Cotypes.—Cat. No. 68626, U.S.N.M.

CYCLICOPORA? MANSFIELDI, new species.

Plate 19, fig. 11.

Description.—The zoarium incrusts Cellepore bryozoa. The zooecia are distinct, separated by a furrow of little depth, elongated, elliptical; the frontal is little convex and covered with large, widely spaced tremopores. The apertura is suborbicular, the proximal border being simply concave; neither cardelles nor peristome are present.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.12 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.35 \text{ mm.} \\ lz = 0.25\text{–}0.30 \text{ mm.} \end{array}\right.$

As our single specimen is without an ovicell, the generic determination must remain doubtful. This species is named in honor of Mr. Wendell C. Mansfield, of the United States Geological Survey, who has collected many interesting specimens of bryozoa for our study.

Occurrence.—Miocene (Yorktown formation): 1½ miles southwest Reed's Ferry, Virginia (very rare).

Holotype.—Cat. No. 68627, U.S.N.M.

CYCLICOPORA(?) GIGANTEA, new species.

Plate 37, fig. 5.

Description.—The zoarium incrusts pebbles. The zooecia are distinct, *gigantic*, ogival or hexagonal; the frontal is convex and formed of a tremocyst with small scattered pores surmounting an olocyst perforated by very minute pores corresponding to the tremopores. The apertura is elongate, elliptical, without lyrule or cardelles, with a concave proximal border; it is surrounded by a salient peristome, more or less thick and widened. The ovicell is hyperstomial, not embedded in the distal zooecium.

Measurements.—Apertura $\begin{cases} ha = 0.30\text{–}0.35 \text{ mm.} \\ la = 0.30\text{–}0.35 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 1.50\text{–}1.60 \text{ mm.} \\ lz = 0.90\text{–}1.40 \text{ mm.} \end{cases}$

Variations.—The micrometric measurements are variable. The tremocyst is detachable and finely granular between the pores. The ovicells of our specimens are broken and we are therefore unable to classify the species without doubt.

Occurrence.—Pleistocene: Santa Monica (Tremochal Canyon), California (rare).

Holotype.—Cat. No. 68628, U.S.N.M.

Genus AIMULOSIA Jullien, 1888.

(For description, see Bulletin 106, U. S. National Museum, p. 428.)

AIMULOSIA ACULEATA, new species.

Plate 21, figs. 10–14.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow, ovoid, wide; the frontal is convex, smooth, perforated laterally by small, scattered, areolar pores; it bears on its median line a small *avicularium* very salient, oblique, orbicular, without pivot. The apertura is semilunar, a little elongate, with a somewhat concave proximal border; the peristome is thick, little salient, and garnished by two distal spines. The ovicell is globular, smooth, quite salient, transverse, very widely open in front of the median avicularium. Frequently there is a small triangular avicularium at the side of the apertura.

Measurements.—Apertura $\begin{cases} ha = 0.10 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.50 \text{ mm.} \\ lz = 0.45 \text{ mm.} \end{cases}$

Variations.—In all the species of this genus there is a very great micrometric difference between the ancestrular zooecia and the marginal ones. Our measurements are the largest that we have observed. The oral avicularium replaces an areolar pore. This is the rule in all the cheilostomatous Bryozoa. This organ is nourished in fact from the interior of the zooecia and must necessarily be in relationship with the mesenchymatous tissue. This avicularium is inconstant in its presence; sometimes it is lacking; sometimes there are two. The irregularity of the avicularia is one of the most tantalizing problems of bryozoology. It will remain unsolved until we know the exact physiological functions of these organs.

The apertura has no fixed measurements; it may be elongate or transverse, large or small. It appears to be in rapport with the size of the zooecium itself. The ancestrula is very small; it is reduced to its apertura; it engenders four normal zooecia and a zooeciule bearing only a salient median avicularium. The presence of the median avicularium is a vital necessity for the zooecium and the first bud of the ancestrula is really this avicularium. The specimens from the Pliocene are still more irregular than those of the Miocene.

Affinities.—This species differs from *Aimulosia brevis* in its large micrometric dimensions and in the presence of areolar pores. It differs from *Aimulosia radiata* in its greater zooecial width, in the absence of interareolar costules, and in the much smaller areolar pores.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (rare); Harvey's Mills, Leon County, Florida (rare); and Muldrow's Mills, 5 miles south of Maysville (rare), South Carolina. Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare).

Cotypes.—Cat. Nos. 68629, 68630, U.S.N.M.

AIMULOSIA BREVIS, new species.

Plate 3, figs. 5–7.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow, ovoid, very short; the frontal is convex, smooth, generally without areolar pores, terminated on the median line by a small, round, very salient avicularium. The apertura is semielliptical; the peristome is little salient, wide, and bears two hollow spines. The ovicell is globular, salient, smooth, transverse with a very large orifice. Frequently there is a triangular avicularium at the side of the peristome.

Measurements.—Apertura $\begin{cases} ha = 0.08 \text{ mm.} \\ la = 0.08 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.30 \text{ mm.} \\ lz = 0.20 \text{ mm.} \end{cases}$

Affinities.—The areolar pores are very small; they are easily closed by fossilization and the zooecia appear deprived of them.

This species differs from *Aimulosia aculeata* in its smaller micrometric measurements and in the apparent absence of areolar pores.

Occurrence.—Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida (rare). Lower Miocene (Bowden marl): Bowden, Jamaica (common). Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare).

Cotypes.—Cat. Nos. 68631–68633, U.S.N.M.

AIMULOSIA RADIATA, new species.

Plate 32, fig. 5.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a furrow, elongate, claviform; the frontal is convex, garnished laterally with large areolar pores and with interareolar costules arranged in radiating rows, and formed of a pleurocyst, slightly granular, surmounting a smooth olocyst; the median avicularium is very salient, oblique, and surmounts a mucro. The apertura is semilunar, located at the base of a short peristomie. The peristome is thick and bears two hollow spines. The ovicell is globular, very salient, smooth, very widely open before the median avicularium.

Measurements.—Apertura$\begin{cases} ha = 0.08 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{cases}$ Zooecia$\begin{cases} Lz = 0.40 \text{ mm.} \\ lz = 0.20\text{–}0.30 \text{ mm.} \end{cases}$

Affinities.—This species is very easy to recognize by its interareolar radiating costules; however, this character is much less apparent on the zooecial margins where the pleurocystal calcification is incomplete.

Occurrence.—Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida (very rare).

Holotype.—Cat. No. 68634, U.S.N.M.

Family EURYSTOMELLIDAE Levinsen, 1909.

Levinsen's original description is as follows:

> No spines. The thick-walled and strongly calcified zooecia lack a covering membrane and have either no pores at all or 2–5 extremely large fenestrae. The broad aperture, which has a concave proximal rim, is provided with a more or less strongly chitinized operculum surrounded by a continuous marginal thickening. No avicularia. The ooecium is enclosed in a kenozooecium, the frontal wall of which is provided with a very large uncalcified part. Pore-chambers [dietellae] or groups of uniporous rosette-plates [septulae].

The two known species classed in this family are *Lepralia foraminigera* Hincks, 1883, and *Lepralia bilabiata* Hincks, 1884. Levinsen believed that the second species is probably the type of a special genus while the first is the type of the genus *Eurystomella*.

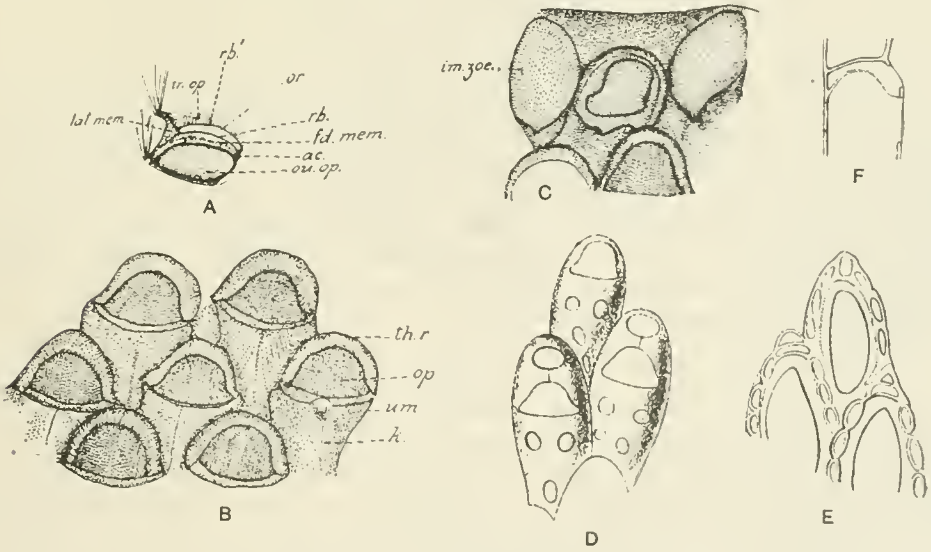


FIG. 26.—Genus *Eurystomella* Levinsen, 1909.

A–C. *Eurystomella bilabiota* Hincks, 1884. A. Sketch showing the operculum dissected out; *rb*, outer rib; *rb'*, inner rib; *in. op.*, inner operculum; *or*, orifice; *lat. mem.*, lateral membrane; *fd. mem.*, folded membrane; *oc*, accessory lip; *ou. op.*, outer operculum. B. A few adult zooecia, × 30; *th. r*, thickened rim; *op*, operculum; *um*, umbo; *k*, keel. C. A few zooecia at the growing edge of the colony showing the membranous aperture of the immature zooecia (*im. zoe.*) (A–C, after Robertson, 1908.)

D–F. *Eurystomella foraminigera* Hincks, 1883. D. Two gonozooecia and an ordinary zooecium, × 40. E. Three zooecia, from the basal surface, which has a large uncalcified central part, × 40. F. A sagittal section through a zooecium with ovicell, × 40. The orifice of the ovicell is closed by the ectocyst. (D–F, after Levinsen, 1909.)

Genus EURYSTOMELLA Levinsen, 1909.

1909. *Eurystomella* Levinsen, Morphological and systematic studies on the cheilostomatous Bryozoa, p. 314.

Characters same as for the family. The operculum closes the ovicell.

EURYSTOMELLA BILABIATA Hincks, 1884.

Plate 37, fig. 6.

1884. *Lepralia bilabiata* Hincks, Polyzoa Queen Charlotte Islands, Annals and Magazine Natural History, ser. 5, vol. 13, p. 49, pl. 3, fig. 1.

1908. *Lepralia bilabiata* Robertson, The incrusting Cheilostomatous Bryozoa of the West coast of North America, University of California Publications, Zoology, vol. 4, no. 5, p. 298, pl. 21, figs. 61–64.

Our fossil specimens of this species are mediocre and do not permit us to add any useful contribution to the knowledge of this remarkable species. We therefore have no modifications to add to Levinsen's description.

Occurrence.—Pleistocene: Dead Man's Island, off San Pedro, California (rare).

Habitat.—Pacific: California and Queen Charlotte Islands.

Plesiotype.—Cat. No. 68635, U.S.N.M.

Family STOMACHETOSELLIDAE Canu and Bassler, 1917.

Genus LEIOSELLA Canu and Bassler, 1917.

(For description see Bulletin 106, U. S. National Museum, p. 448.)

LEIOSELLA EDAX, new species.

Plate 22, figs. 1–6.

Description.—The zoarium is free, unilamellar, often tubular; it was attached to the delicate radicells of algae. The zooecia are indistinct. The peristomice is very large, elongate, provided with a large rimule spiramen; the peristomie is deep; the apertura (in the interior) is semilunar with a concave proximal border. The ovicell is placed in the peristomie; it is widely open above the operculum; it bears a circular, very fragile frontal area. Around the peristomice there are three or four small, round, salient avicularia, with two denticles for pivot; they are sometimes transformed into large avicularia with spatulate mandibles. Another avicularium opens into the peristomie.

Measurements.—Apertura $\begin{cases} ha = 0.15 \text{ mm.} \\ la = 0.125 \text{ mm.} \end{cases}$ Zooecia (interior) $\begin{cases} Lz = 0.40 \text{ mm.} \\ lz = 0.30\text{–}0.35 \text{ mm.} \end{cases}$

Affinities.—The aspect of this species is quite variable and depends solely on the number and development of the frontal avicularia. It appears very greedy for oxygen, a fact which is supported by the great thickness of its frontal wall and the activity of the calcareous secretion. Sometimes two small avicularia are replaced by a much larger one with large spatulate mandible.

The peristomie is the real seat of life of this species. An avicularum (visible from the interior) opens into the lateral portion. The distal portion is reserved for the ovicell. Finally, the pseudo-rimule spiramen in the proximal portion is the orifice of the hydrostatic system. It is probable that the female polypide disappears by histolysis at the moment of the development of the embryos and the escape of the larva.

Occurrence.—Lower Miocene (Chipola marl): Chipola River, Calhoun County, Florida (rare).

Cotypes.—Cat. No. 68636, U.S.N.M.

Family SMITTINIDAE Levinsen, 1909.

Genus SMITTINA Norman, 1903.

(For description see Bulletin 106, U. S. National Museum, p. 456.)

SMITTINA TRISPINOSA Johnston, 1838.

Plate 22, figs. 7–14.

1838. *Lepralia trispinosa* Johnston, History of British Zoophytes, p. 324, pl. 57, fig. 7.
1889. *Smittia trispinosa* Jelly, A synonymic catalogue of marine Bryozoa, p. 252 (general bibliography).
1894. *Smittia trispinosa* Levinsen, Zoologica Danica (Danske Dyr), Heft 9, p. 70, pl. 6, figs. 10, 11.
1896. *Smittia trispinosa* Neviani, Briozoi Postpliocenici di Spilinga (Calabria), Atti Accademia Gioenia di Scienze Naturali in Catania, ser. 4, vol. 9, p. 41, fig. 22.
1899. *Smittia trispinosa* Waters, Bryozoa from Maderia, Journal Royal Microscopical Society, p. 16.
1900. *Smittia trispinosa* Robertson, Papers from the Harriman Alaskan Expedition, VI, The Bryozoa, Proceedings Washington Aacademy Sciences, vol. 2, p. 327.
1902. *Smittia trispinosa* Calvet, Bryozoaires marins de la region de Cette, Travaux de l'Institut de Zoologie de Montpellier, Mem. 11, p. 56.
1902. *Smittia trispinosa* Calvet, Bryozoaires marins des cotes de Corse, Travaux de l'Institut de Zoologie de Montpellier, Mem. 12, p. 30.
1907. *Smittina trispinosa* Nordgaard, Bryozoen von dem norwegischeu Fischereidampfer "Michael Sars," Bergens Museums Aarbog, no. 2, p. 15.
1908. *Smittia trispinosa* Robertson, The incrusting cheilostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 4, pl. 22, figs. 68–70.
1910. *Smittia trispinosa* Osburn, Bryozoa of the Woods Hole region, Bulletin Bureau of Fisheries, vol. 30, p. 246, pl. 27, fig. 65 (American bibliography).
1912. *Smittina trispinosa* Nordgaard, Revision av Universitets museets samling av norske Bryozoer, Kgl. norske Videnskabers Selskabs Skriften, no. 3, p. 22.
1914. *Smittina trispinosa* Osburn, The Bryozoa of the Tortugas Islands, Florida, Publications of the Carnegie Institution of Washington, no. 182, p. 208.

Variations.—This species is extremely variable and many varieties are known. The varieties *arborea* Levinsen and *lamellosa* Smitt appear to be peculiar to the boreal regions. The varieties *munita* Hincks, *bimucronata* Hincks, *nitida* Verril, *japonica* Ortmann, etc., have no particular geographic extension and they generally accompany the type. The varieties, of which we have not cited the bibliography, are established either on the zoarial aspect or on the form of the avicularian mandibles; that is to say, on very secondary characters. Calvet, 1902, has shown that these characters themselves are rather characters of variations.

The detailed study of the variations would be desirable and would permit perhaps the discovery of the cause of them, which would be very important from the biologic point of view. It is probable that the richness of the waters in planktonic elements, the swiftness of the currents, the nature of the substratum, the agitation of the waters, and the nature of the bottom are the causes of the variations of which it is important to establish exact limits.

The geographic distribution of this species is universal; it has been discovered in all the explored seas. According to the known rules, the geological distribution must be correlative. But it is not so; only Waters and Neviani have mentioned fossil specimens.

The constant characteristic of this species is its very regular mode of gemmation (fig. 10) operating alternately between the walls which are absolutely rectilinear and deprived of septules. The pseudo-rimule of the peristomice has no avicularium as in almost all other species of the genus. This avicularium is generally placed on the line of the areolar pores and sometimes on the frontal; it is unequally developed and almost always triangular on our fossils. The lyrule is very small; it is more or less visible according to the development of the lateral lips of the peristomice.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.08\text{–}0.10 \text{ mm.} \\ la = 0.08\text{–}0.10 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.36\text{–}0.50 \text{ mm.} \\ lz = 0.20\text{–}0.30 \text{ mm.} \end{array}\right.$

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (common). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare). Pliocene (Caloosahatchee marl): Shell Creek, De Soto County (common), and Monroe County, Florida (common). Pleistocene: Vero (rare), Simmons Bluff, Yonges Island, Charleston County, South Carolina (common), and Daytona, Florida (rare.)

Geological distribution.—Miocene of Australia (Waters); Quaternary of Sicily (Neviani).

Habitat.—Cosmopolitan to a depth of 160 meters.

Plesiotypes.—Cat. Nos. 68637–68640, U.S.N.M.

SMITTINA MALEPOSITA, new species.

Plate 31, figs. 10, 11.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a salient thread, little elongate, hexagonal, *poorly oriented;* the frontal is little convex and formed of a granular pleurocyst surrounded by a row of areolar pores separated by very short costules. The apertura is semilunar with a very short proximal lyrule; the peristomie is of little depth and the peristomice is suborbicular. The ovicell is large, globular, finely perforated. On the median line of the frontal there is a small thin avicularium the beak of which is directed toward the bottom.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.10 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.40 \text{ mm.} \\ lz = 0.32 \text{ mm.} \end{array}\right.$

Affinities.—This species is quite close to *Smittina trispinosa* Johnston, 1838. It is distinguished from it by its somewhat larger peristomice and by the place of its avicularium, always placed in the vicinity of the median line of the zooecium. The position of this avicularium is everywhere rather variable, but its presence is constant. There is therefore a group of *Smittina* in which the avicularium is not directly supported on the lyrule. We do not believe that this character should be generic, for it does not appear to correspond to an essential and different function.

Occurrence.—Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida (very rare). Pleistocene or Recent: Vero, Florida (rare).

Cotypes.—Cat. Nos. 68641, 68642, U.S.N.M.

SMITTINA OPHIDIANA Waters, 1877.

Plate 3, fig. 3.

1879. *Smittina reticulata*, var *ophidiana* Waters, On the Bryozoa (Polyzoa) of the Bay of Naples, Annals and Magazine of Natural History, ser. 5, vol. 3, p. 40, pl. 9, fig. 1.

1885. *Smittina reticulata*, var. *ophidiana* Waters, On the use of the avicularium mandible in the determination of Chilostomatous Bryozoa, Journal Royal Microscopical Society, ser. 2, vol. 5, pl. 14, fig. 6.

1889. *Smittia ophidiana* Waters, Bryozoa from New South Wales, Annals and Magazine of Natural History, ser. 6, vol. 4, pl. 3, fig. 19.
1903. *Smittia ensifera* Jullien, Bryozoaries provenant des Campagnes de *l'Hirondelle* (1886–1888), Resultats des Campagnes Scientifiques du Prince de Monaco, fasc 23, p. 102, pl. 12, fig. 4.
1904. *Smittia ophidiana* Waters, Resultats Voyage Belgica, Zoologie Bryozoa, p. 66.
1907. *Smittia ophidiana* Calvet, Expédition scientifiques du *Travailleur* et *Talisman*, Bryozoaires, p. 433 (bibliography).

Affinities.—This species is very close to *Smittina marmorea* but differs from it in the presence of costules and of areolar pores close together (and not scattered punctations) and the constant presence of two frontal pores.

Occurrence.—Miocene (Bowden marl): Bowden, Jamaica (very rare).

Geographic distribution.—Mediterranean at Naples; Atlantic at the Azore Isles (80–130 meters).

Plesiotype.—Cat. No. 68643, U.S.N.M.

SMITTINA GRANDICELLA, new species.

Plate 37, figs. 10–12.

Description.—The zoarium incrusts shells in one or more layers. The zooecia are distinct, separated by a furrow, elongate, elliptical, *large;* the frontal is convex and formed of an olocyst surmounted by a pleurocyst. The apertura is semi-elliptical; the lyrule is short and wide; the peristome is little salient, hardly indented in the proximal portion, and bears three distal spines..

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.12\text{–}0.13 \text{ mm.} \\ la = 0.13\text{–}0.15 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.55 \text{ mm.} \\ lz = 0.32\text{–}0.40 \text{ mm.} \end{array}\right.$

Affinities.—This species much resembles *Smittina trispinosa* Johnston, 1838, for it often bears a large avicularium on the line of areolar pores; it is distinguished from it in its large zooecial dimensions and in the much less regular arrangement of the zooecia. The gemmation is identical, but the lines of the nonseptular walls are less rigorously rectilinear and often sinuous (fig. 12). The beak of the avicularium is round and salient.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (rare).

Cotypes.—Cat. No. 68644, U.S.N.M.

SMITTINA DISCOIDEA, new species.

Plate 38, figs. 1–7.

Description.—The zoarium is unilamellar, *discoidal*, very large; the lower face is concentrically wrinkled and the nonseptular walls are visible in the form of radial costules somewhat salient. The zooecia are little distinct, elongate, more or less marginate; the frontal is very little convex and formed of an olocyst surmounted by a detachable pleurocyst with large interareolar costules. The apertura is semilunar; the lyrule is short and lamellose; the peristome is not salient, and the peristomie is excavated in the thickness of the frontal wall. The ovicell is globular, salient, deeply embedded in the distal zooecium; it is surrounded by a little salient collar. On the line of the areolar pores there is an enormous triangular avicularium with pivot or with condyles of which the beak is acuminate, salient, and pointed upward.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.09 \text{ mm.}\\ la=0.10\text{–}0.12 \text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.50\text{–}0.60 \text{ mm.}\\ lz=0.25 \text{ mm.}\end{array}\right.$

Affinities.—This species is of the group of *Smittina trispinosa* Johnston, 1838, in all its characters; it differs from it in the size, the form, and the direction of its avicularium. This avicularium is sometimes interzooecial (fig. 2). We are ignorant of the causes which result in the variations in size, direction, and form of the avicularia. These biologic variations are still to be studied. On the ovicelled zooecia the large avicularium is often transformed into two smaller ones (fig. 3). In the interior (fig. 7) the lyrule is laterally accompanied by two kinds of condyles, probably replacing the small cardelles.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (common).

Cotypes.—Cat. No. 68645, U.S.N.M.

SMITTINA CALIFORNIENSIS Robertson, 1908.

Plate 37, figs. 7–9.

1908. *Smittia californiensis* ROBERTSON, The incrusting cheilostomatous Bryozoa of the west coast of North America, University of California Publications Zoology, vol. 4, p. 303, pl. 22, fig. 71.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.12 \text{ mm.}\\ la=0.12 \text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.70 \text{ mm.}\\ lz=0.30 \text{ mm.}\end{array}\right.$

Variations.—We do not know all the variations of Miss Robertson's species; we are therefore not exactly certain of our determination. However, our specimens bear the principal characters. The peristome is little salient; it frequently bears two large lateral lips, leaving between them a false rimule (fig. 7). We have found some zooecia bearing a large, lateral avicularium; the latter is replaced by two smaller, thin avicularia whose beak is turned toward the bottom (figs. 8, 9,) or indeed one toward the top and the other toward the bottom. The interareolar costules are thin (fig. 7) or very thick (fig. 8). The interzooecial avicularium bears a rectilinear pivot. The zoarium is bilamellar while that in Miss Robertson's species is incrusting.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Habitat.—Pacific, off California.

Plesiotypes.—Cat. No. 68646, U.S.N.M.

SMITTINA(?) BREVIS Canu and Bassler, 1919.

Plate 2, figs. 20, 21.

1919. *Smittina? brevis* CANU and BASSLER, Geology and Paleontology of the West Indies, Bryozoa, Publication of the Carnegie Institution of Washington, No. 291, p. 93, pl. 2, fig. 2.

Description.—The zoarium is bilamellar with fronds somewhat compressed. The zooecia are little distinct, elongate, elliptical; the frontal is convex and very *short* and it bears below a large salient avicularium with rounded beak. The apertura is elliptical and deep. The ovicell is globular, little salient, ornamented by a fragile circular area; it opens into the peristomie.

Affinities.—This species is quite unique and difficult to classify. We have put it in *Smittina* because the ovicell opens into the peristomie formed by the thickening of the frontal walls; but it does not really belong to this genus because it has no lyrula nor oral avicularium and because the apertura is not semilunar.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare).

Holotype.—Cat. No. 68647, U.S.N.M.

SMITTINA PORIFERA Hincks, 1884.

Plate 38, fig. 9.

1884. *Porella marsupium* forma *porifera* Hincks, Report on Polyzoa of Queen Charlotte Islands, Annals Magazine Natural History, ser. 5, vol. 13, p. 50 (sep. 24), pl. 4, fig. 4.

1887. *Porella marsupium*, var. *porifera* Waters, Tertiary Cheilostomatous Bryozoa from New Zealand, Quarterly Journal Geological Society London, vol. 42, p. 63.

Description.—The zoarium is incrusting. The zooecia are distinct, swollen, separated by a deep furrow, very convex, perforated by some pores widely spaced. The frontal is a pleurocyst garnished laterally with six large areolar pores, of which the two superior ones are sometimes changed into avicularia. The apertura is deep, hidden by the peristomie and by a small, salient, orbicular, oral avicularium. The peristome is thin and bears four small spines which are often replaced by a small distal orbicular avicularium (rarely two). There is a very small lyrula hidden by the frontal avicularium. The ovicell is globular, salient, smooth; it opens above the operculum by a very large opening.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.12 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.45 \text{ mm.} \\ lz = 0.28 \text{ mm.} \end{array}\right.$

The avicularium chamber forms a frontal gibbosity perforated by four large pores. The latter characterize the species, for they do not exist in *Porella marsupium* MacGillivray.

Occurrence.—Pleistocene: Santa Monica (Long Wharf Canyon), California (rare).

Geological distribution.—Pliocene of New Zealand (Waters).

Habitat.—Queen Charlotte Islands (Hincks).

Plesiotype.—Cat. No. 68648, U.S.N.M.

Genus PORELLA Gray, 1848.

(For description, see Bulletin 106, U. S. National Museum, p. 479.)

PORELLA BELLA Busk, 1860.

Plate 1, fig. 12.

1860. *Lepralia bella* Busk, Zoophytology, Quarterly Journal Microposcopical Science, vol. 8, pl. 27, fig. 2, 3.

1873. *Escharella landsborovi* Smitt, Floridan Bryozoa, pt. 2, Kongl. Seven. Vet. Akad. Hand., vol. 11, no. 4, p. 60, pl. 10, figs. 201, 202.

1880. *Smittia bella* Hincks, British Marine Polyzoa, p. 352, pl. 42, figs. 9, 10.

1919. *Porella bella* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution, no. 291, p. 93, pt. 1, fig. 15.

We are not certain that Busk's species is identical with that of Smitt, as the former author represents it, but is evident that the characters of our Antigua fossil, although it is poorly preserved, are in harmony with Smitt's figures. Following are the measurements of this fossil.

Apertura $\left\{\begin{array}{l} ha = 0.16 \text{ mm.} \\ la = 0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.90 \text{ mm.} \\ lz = 0.70 \text{ mm.} \end{array}\right.$

Occurrence.—Oligocene (Antigua formation): Rifle Butts, Antigua, Leeward Islands (rare).

Habitat.—Shetland Islands. Waters off Florida (185 meters).

Plesiotype.—Cat. No. 68649, U.S.N.M.

PORELLA REVERSA Ulrich and Hassler, 1904.

Plate 23, figs. 5–10.

1904. *Lepralia ? reversa* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 426, pl. 113, figs. 1, 2.

The original description is as follows:

> Zoarium forming parasitic patches, several centimeters in diameter and composed of a single layer, on shells. Zooecia oblong quadrate or subhexagonal, generally arranged in rather regular longitudinal and diagonally intersecting rows, each about 0.5 mm. in length and 0.3 mm. in width. Orifice rather large, rounded-quadrate, enclosed by a peristome of moderate thickness and elevation. Peristomes divided into two parts, anterior and posterior, the former either straight or slightly arcuate and not so prominent as the horseshoe-shaped portion enclosing the sides and proximal margins of the orifice. Distal extremities of the latter portion of the peristome often a little thickened and projecting slightly inward. Just behind the proximal border of the orifice there is constantly a rather small but prominently elevated and thick-walled avicularium, opening obliquely forward. Remainder of front zooecia with from one to three rows of large pores. Frequently adjoining zooecia are separated by a thin raised line. Ovicells moderately convex, rather large, with a central pore and one or two somewhat radially disposed marginal rows of smaller pores. When broken they leave a sharply defined concave space in front of the orifice, slightly exceeding the latter in size.
>
> The division of the peristome into two parts as described is unusual and produces the probably false appearance of a reversal of the ends of the operculum that has suggested the specific name. If it could be proved that the hinge of the operculum was really on the distal side of the orifice instead of the proximal, then this species would be distinct enough to justify the erection of a new genus for its reception; but until this unusual condition can be demonstrated we think it well to regard it as related to such species as *Lepralia pallasiana*. We know of none resembling it closely enough to require unusual care in its discrimination.

Measurements.—Apertura $\begin{cases} ha = 0.15 \text{ mm.} \\ la = 0.13 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.45\text{–}0.55 \text{ mm.} \\ lz = 0.25\text{–}0.30 \text{ mm.} \end{cases}$

A reexamination of the type specimen shows this species should be classed in the genus *Porella*. It is well characterized by its embedded aperture, by its infraoral avicularium, and by its ovicell perforated like the frontal. Finally the interior shows the parietal arrangement habitual in the Smittinidae (fig. 10).

Occurrence.—Miocene (St. Mary's formation): Cove Point, Maryland (rare). Miocene; Kuhns, Carteret County, North Carolina (rare).

Cotypes and *Plesiotype.*—Cat. Nos. 68650, 68651, U.S.N.M.

PORELLA COLLIFERA Robertson, 1908.

Plate 38, figs. 10–15.

1908. *Porella collifera* Robertson, The incrusting cheilostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 4, no. 5, p. 304, pl. 23, fig. 72.

Measurements.—Apertura $\begin{cases} ha = 0.24 \text{ mm.} \\ la = 0.20 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.80\text{–}1.00 \text{ mm.} \\ lz = 0.50\text{–}0.60 \text{ mm.} \end{cases}$

Variations.—The zoarium incrusts pebbles. The peristome is very salient especially in the proximal portion. The oral avicularium rests on a wide but little salient lyrule; it is often only visible by a suitable inclination of the preparation so that the bottom of the peristome can be seen. The zooecia are sometimes bordered by a salient thread (fig. 13). The ovicell is very small (fig. 11). In the the interior the olocyst is perforated by very small pores corresponding to the large widened pores of the superposed tremocyst.

Occurrence.—Pleistocene: Santa Monica (rare) and Santa Barbara, California (common).

Habitat.—Pacific: Coronado Islands (24–29 meters).

Plesiotypes.—Cat. No. 68652, U.S.N.M.

Genus PALMICELLARIA Alder, 1864.

1864. *Palmicellaria* ALDER, Description New British Polyzoa, Quarterly Journal Microscopical Society, new ser., vol. 4, p. 100.

The apertura is orbicular, semicircular, or semielliptical. Neither lyrula nor cardelles are present. The ovicell opens in the peristomie. The frontal is a granular pleurocyst, surrounded with areolar pores. The peristomie is much developed. Often an avicularian mucro partially hides the apertura.

Genotype.—*Palmicellaria elegans* Alder, 1864.

Range.—Miocene to Recent.

The known species of this genus are:

Palmicellaria elegans Alder, 1864.
Palmicellaria (*Millepora*) *skenei* Solander, 1786.
Palmicellaria (*Eschara*) *lorea* Alder, 1864.
Palmicellaria inermis Jullien, 1882.
Palmicellaria tenuis Calvet, 1907.

Structure.—The species of this genus are garnished with areolar pores and they therefore do not belong to the genus *Porella* Gray, 1848, as we have limited it. The absence of the lyrula and of cardelles distinguishes it from *Smittina*.

Historical.—For a long time, on the authority of Waters, the species of this genus have been classed in the genus *Porella* Gray, 1848, because the known mandibles are identical. The opercula and mandibles of *Palmicellaria skenei* Solander, 1786, are indeed those of *Porella*. The mandible of *P. lorea* Alder, 1864, is also that of *Porella*, but the operculum is semielliptical and of quite a divergent type from other *Porellas*. The chitinous appendages of the genotype and of the other species are unfortunately unknown.

All of the species cited having without exception the same characteristic of calcification, namely, a granular pleurocyst surrounded by areolar pores, we believe that it is necessary to maintain Alder's genus, although it does not appear to us very well marked.

PALMICELLARIA cf. INERMIS Jullien, 1882.

Plate 4, fig. 13.

Our figured specimen is too incomplete to be named with certainty, but we are introducing it to call attention to the genus in the early Miocene. This specimen is deprived of ovicell and its aperture is invisible. It approaches *Palmicellaria inermis* Jullien, 1882, but it differs from it in its larger micrometric measurements and in its apertura, which does not appear transverse.

Occurrence.—Miocene (Bowden horizon): Santo Domingo.

Plesiotype.—Cat. No. 68653, U.S.N.M.

PALMICELLARIA COSTULATA, new species.

Plate 45, figs. 12, 13.

Description.—The zoarium incrusts corals. The zooecia are distinct, separated by a broad furrow, little elongated; the frontal is very convex, thick, covered by a tremocyst with large pores, garnished with broad radiating *costules*, and ending in a very salient avicularium. The apertura is semielliptical, transverse, deeply buried, partially hidden by the avicularian mucro. The ovicell is deeply embedded in the distal zooecium; it is large, little salient, similarly covered with large radiating costules.

Measurements.—Apertura $\left\{\begin{matrix} ha=0.09\text{ mm.} \\ la=0.13\text{ mm.} \end{matrix}\right.$ Zooecia $\left\{\begin{matrix} Lz=0.45\text{–}0.50\text{ mm.} \\ lz=0.40\text{ mm.} \end{matrix}\right.$

Affinities.—In the vicinity of the ancestrula the avicularian mucro is not constant; it is often replaced by small salient orbicular avicularia irregularly arranged around the apertura.

This beautiful species on account of its frontal irregularities is very difficult to photograph. Better preserved specimens, moreover, will probably show new characters necessitating its classification in another genus. The species is certainly shorter than *Lepralia corrugata* MacGillivray, 1895, which has some resemblance.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (rare).

Cotypes.—Cat. No. 68654, U.S.N.M.

PALMICELLARIA CONVOLUTA Ulrich and Bassler, 1904.

Plate 23, figs. 1–3.

1904. *Palmicellaria convoluta* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 427, pl. 16, figs. 2–4.

The original description of this species is as follows:

> Zoarium erect, forming loose masses 3 cm. or more in diameter, consisting of broad, bifoliate, convoluted, anastomosing leaves, 1.0 mm. or more in thickness. Zooecia prominent, distinct, oval, rhomboidal or hexagonal, arranged in irregular quincunx, averaging between 0.9 mm. and 1.0 mm. in length and about 0.45 mm. in width; surface rather coarsely punctured; orifice terminal, the proximal edge overhung by a prominent mucro containing an avicularium the sagittate opening of which is divided into two unequal parts by a septum and lies on the abrupt distal slope of the mucro so as to be nearly or entirely concealed in a front view. When the apex of the mucro is worn or broken away the cavity of the avicularium is exposed to view as a cell immediately behind the orifice and almost equaling it in size. Ovicells small, transverse, bulbous, closely united to the cell next above.

Measurements.—Apertura $\left\{\begin{matrix} ha=0.15\text{ mm.} \\ la=0.20\text{ mm.} \end{matrix}\right.$ Zooecia $\left\{\begin{matrix} Lz=0.85\text{–}1.00\text{ mm.} \\ lz=0.45\text{–}0.50\text{ mm.} \end{matrix}\right.$

The essential features of this species are noted in the original description.

Occurrence.—Miocene (Calvert formation): Reeds, Maryland (rare).

Cotypes.—Cat. No. 68655, U.S.N.M.

PALMICELLARIA PUNCTATA Ulrich and Bassler, 1904.

Plate 23, fig. 4.

1904. *Palmicellaria punctata* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 428, pl. 116, fig. 1.

Only the type specimen of this species, a fragment of bifoliate zoarium, is known, and our studies upon it must remain incomplete. This specimen shows punctate zooecia with a subcircular orifice and a mucro like the preceding, but its zooecia are much smaller than *Porella* (*Palmicellaria*) *convoluta* Ulrich and Bassler, 1904, of the Maryland Miocene, and its mucro is less prominent. The ovicells however are relatively larger and longer.

Measurements.—Apertura $\begin{cases} ha=0.10 \text{ mm.} \\ la=0.20 \text{ mm.} \end{cases}$ Zooecia, irregular.

Occurrence.—Miocene (Calvert formation): Reeds, Maryland (very rare).

Holotype.—Cat. No. 68656, U.S.N.M.

Genus RHAMPHOSTOMELLA Lorenz, 1886.

(For description see Bulletin 106, U. S. National Museum, p. 476.)

RHAMPHOSTOMELLA LATICELLA Canu and Bassler, 1919.

Plate 5, fig. 13.

1919. *Rhamphostomella laticella* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 94, pl. 5, fig. 12.

The figured specimen is the only one found; it is unfortunately incomplete and worn and does not permit a detailed description. It incrusts a shell; the areolar costules are rare or little visible. The oral avicularium is quite large, oblique, the point directed toward the bottom.

Occurence.—Lower Miocene (Bowden marl): Bowden, Jamaica (very rare).

Holotype.—Cat. No. 68657, U.S.N.M.

RHAMPHOSTOMELLA GRANULOSA, new species.

Plate 3, fig. 2.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, elongated, elliptical; the frontal is very convex, covered with a *granular* pleurocyst and bordered with small areolar pores. The apertura is large, elongated, and deformed by a small, elongated, triangular avicularium arranged obliquely. The ovicell is globular, very salient, and covered also with a granular pleurocyst.

Measurements.—Apertura $\begin{cases} ha=0.15 \text{ mm.} \\ la=0.10 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz=0.55 \text{ mm.} \\ lz=0.25\text{–}0.30 \text{ mm.} \end{cases}$

Affinities.—The zooecia are very irregular in their micrometric measurements. The areolar pores are often hidden by the pleurocyst.

This species approaches *Rhamphostomella brendolensis* Waters, 1891, which is often deprived of costules, but differs from it in the presence of the frontal granules.

Occurence.—Miocene (Bowden marl): Bowden, Jamaica (very rare).

Holotype.—Cat. No. 68658, U.S.N.M.

Genus CYSTISELLA Canu and Bassler, 1917.

(For description, see Bulletin 106, U. S. National Museum, p. 479.)

CYSTISELLA AVICULIFERA, new species.

Plate 38, fig. 8.

Description.—The zoarium incrusts pebbles or algae. The zooecia are distinct, elongate, subelliptical, swollen: the frontal is convex, smooth or bears an *avicularian* chamber rather large and somewhat salient. The apertura is semicircular and placed at the base of a deep peristomie; the peristome is thin, salient, and bears two or three orbicular avicularia. The ovicell is large, hyperstomial, convex, globular, smooth; it opens into the peristomie by a very large opening placed above the operculum.

Measurements.—Peristomice$\left\{\begin{array}{l} hpe=0.15\text{–}0.18\text{ mm.}\\ lpe=0.16\text{ mm.}\end{array}\right.$ Zooecia$\left\{\begin{array}{l} Lz=0.65\text{ mm.}\\ lz=0.40\text{ mm.}\end{array}\right.$

Affinities.—Our micrometric measurements are taken on the marginal zooecia; at the center of the zoarium they are much smaller, the frontal of the zooecia being much reduced there. The ancestrular zooecia appear to be erect as in the Celleporidae; this aspect is deceiving and is occasioned by the presence of small peristomial avicularia; they are perfectly oriented like the marginal zooecia but much smaller. The relative constancy of the peristomice permits us to utilize the micrometric measurements. The frontal avicularian chamber is much smaller than in the other species of the same genus; but the absence of the areolar pores leaves no doubt as to the exactness of our generic determination. The multiplicity of avicularia on a given species always reveals whether the water was calm or not very agitated.

Occurrence.—Pleistocene: Santa Barbara (rare) and Santa Monica, California (rare).

Holotype.—Cat. No. 68659, U.S.N.M.

Family RETEPORIDAE Smitt, 1867.

Genus RETEPORA Imperato, 1599.

(For description, see Bulletin 106, U. S. National Museum, p. 500.)

RETEPORA DOVERENSIS Ulrich and Bassler, 1904.

Plate 23, figs. 11–17.

1904. *Retepora doverensis* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 422, pl. 111, figs. 5–7; pl. 115, figs. 1–5.

The original description follows:

> Zoarium reticulate, fenestrae of variable size, averaging 0.8 mm. long and about 0.4 mm. wide. Branches varying from 0.2 mm. to 1.0 mm. wide, usually about 0.6 mm.; reverse solid, the surface generally smooth, occasionally minutely granulose, divided into irregular angular spaces by fine impressed or raised lines that may or may not correspond with the bases of the zooecial walls. Zooecia immersed, with oblique imbricating and slightly flaring mouths, and a narrow notch in the elevated and angular proximal border. The appearance of the celluliferous surface varies greatly in different specimens, the difference being due chiefly to the presence or absence and number of the avicularia and ovicells. The latter appear as bulbous inflations with a slit running from the center to one edge. When they occur at all it is usually in abundance. Of avicularia there are at least two sets, the larger ones occurring on the front of the zooecia, forming its highest part and causing it to appear inflated.

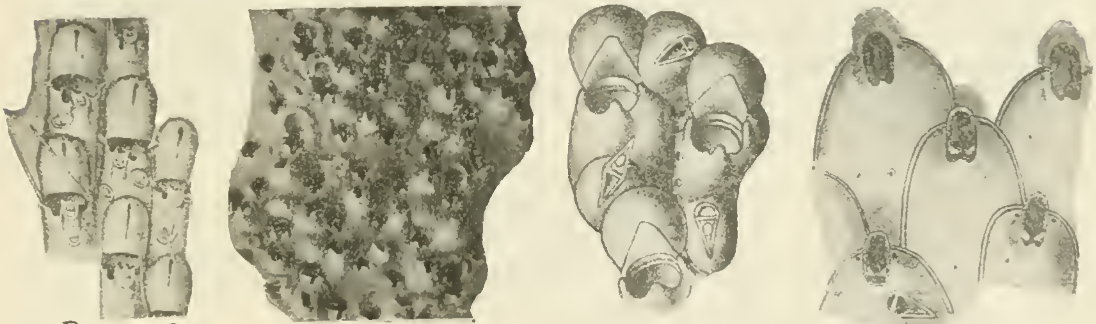
Those of the smaller set occur in the depressed spaces, usually close beside the zooecial orifice, and rarely on the reverse of the branches.

This common species of the Choptank formation apparently belongs to the *Retepora-cellulosa* group of Waters. Though resembling several of the species of the group rather closely we could not decide that it was any nearer to one than to another. Still, having found it difficult to make thoroughly satisfactory comparisons, we will not be greatly surprised should future study prove *R. doverensis* to belong to some previously described species.

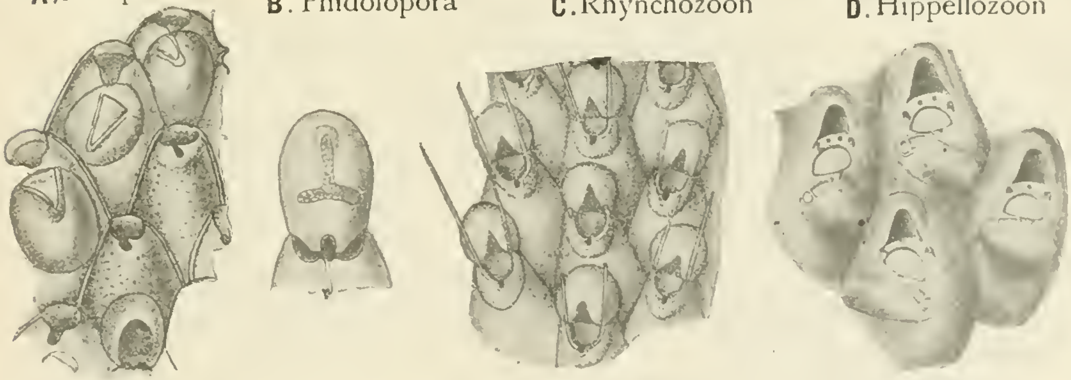
The peristome bears a wide, very irregular, rimule spiramen. The ovicell is fissured.

Occurrence.—Miocene (Choptank formation): Dover Bridge and Jones Wharf, Maryland (common).

Cotypes and plesiotypes.—Cat. Nos. 68660, 68661, U.S.N.M.



A. Retepora B. Phidolopora C. Rhynchozoon D. Hippellozoon



E. Schizellozoon F. Triphyllozoon G. Schizotheca H. Lepraliella

FIG. 27.—Genera of the family Reteporidae Smitt, 1867.

A. *Retepora beaniana* King, 1846, × 25. Recent. (After Hincks, 1880.) B. *Phidolopora labiata* Gabb and Horn, 1865, × 20. Pleistocene of California. C. *Rhynchozoon angulatum* Levinsen, 1909, × 55. Recent. (After Levinsen, 1909.) D. *Hippellozoon novaezelandiae* Waters, 1894, × 25, Recent. (After Waters, 1894.) E. *Schizellozoon imperati* Busk, 1884, × 25. Recent. (After Waters, 1885.) F. *Triphyllozoon moniliferum* MacGillivray, 1860, × 85. Recent. (After Waters, 1894.) G. *Schizotheca fissa* Busk, 1858, × 45. Recent. (After Hincks, 1880.) H. *Lepraliella contigua* Smitt, 1867. Recent. (After Levinsen, 1916.)

Genus PHIDOLOPORA Gabb and Horn, 1862.

1862. *Phidolopora* Gabb and Horn, Monograph Polyzoa of the Secondary and Tertiary Formations of North America, Journal Academy National Science Philadelphia, ser. 2, vol. 5, p. 138.

The frontal of the ovicell is not fissured. The aperture is semilunar, with a concave proximal border. The peristomice bears a rimule spiramen. The frontal is an olocyst. No labial avicularium.

Genotype.—*Retepora labiata* Gabb and Horn, 1862. Pleistocene, Recent.

Affinities.—The apertura is identical with that of the genus *Retepora* Imperato, 1859, as Waters has limited it in 1913. The genus *Phidolopora* Gabb and Horn, 1862, differs from it in the absence of a fissure on the ovicell, in the replacement of the spiramen by a rimule of the peristomice, and in the absence of the labial avicularium. Moreover, the frontal is an olocyst, a character which does not exist notably in the group of *Sertella* Jullien, 1903. The definition of Gabb and Horn 1862, has no significance; it is even little comprehensible: "It differs from *Retepora* by the scattered special pores over the surface of the colony." *Retepora pacifica* Robertson, 1908, belongs absolutely to the same group and shows the generic characteristics clearly.

PHIDOLOPORA PACIFICA Robertson, 1908.

Plate 39, figs. 1-7.

1908. *Retepora pacifica* Robertson, The incrusting cheilostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 4, p. 310, pl. 24, figs. 81-84.

Measurements.—Peristomice: $lpe = 0.14–0.16$ mm.

$$\text{Zooecia}\begin{cases} Lz = 0.40–0.60 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{cases} \qquad \text{Fenestrae}\begin{cases} Lf = 1.75 \text{ mm.} \\ lf = 0.50 \text{ mm.} \end{cases}$$

Affinities.—This species differs from *Phidolopora labiata* Gabb and Horn, 1862, in its larger peristomice always wider than 0.14 mm.; thus the apertures appear closer together. The small tongue on the ovicell mentioned by Miss Robertson is too fragile to be preserved on the fossils. The zooecia deprived of the large frontal avicularium bear some small scattered pores. In tangential section the vibices appear clearly. They are therefore formed by a very dense calcification in the entire thickness of the zoarial dorsal. Sometimes the dorsal bears radicular pores. In transverse sections the lacunae appear very irregularly arranged.

Occurrence.—Pleistocene: Santa Monica (rare), and Dead Mans Island, off San Pedro (rare), California.

Habitat.—Coast of California.

Plesiotypes.—Cat. No. 68662, U. S. N. M.

PHIDOLOPORA LABIATA Gabb and Horn, 1862.

Plate 39, figs. 13-17.

1862. *Phidolopora labiata* Gabb and Horn, Monograph Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy Natural Sciences, Philadelphia, ser. 2, vol. 5, p. 138, pl. 19, fig. 21.

Description.—The zoarium is reticulated; the fenestrae are narrow and elongated. The zooecia are distinct, margined by a salient thread, elongate, fusiform; the frontal is slightly convex and smooth. The apertura (visible only in the interior) is transverse, subelliptical; the peristomice bears a rimule spiramen arranged between two salient lips. The ovicell is large, convex, smooth, buried in the distal zooecium; its orifice is very large and located in front of the two lips. Many zooecia bear a very large avicularium arranged obliquely on the frontal and provided with a curved, very salient beak. The zooecia without avicularia bear some small scattered pores.

Measurements.—Peristomice: $lpe = 0.10$ mm.

$$\text{Zooecia}\begin{cases} Lz = 0.46\text{–}0.60 \text{ mm.} \\ lz = 0.20\text{–}0.30 \text{ mm.} \end{cases} \qquad \text{Fenestrae}\begin{cases} Lf = 2.00 \text{ mm.} \\ lf = 0.30\text{–}0.75 \text{ mm.} \end{cases}$$

Affinities.—This species differs from *Phidolopora pacifica* Robertson, 1908, in the smaller dimensions of its peristomice, which measure more than 0.10 mm. The general aspect is therefore that of bearing apertures much more scattered and in having a peristomice much smaller than the zooecial width.

The micrometric variations are extraordinary. On the same zoarium one may find zooecia 0.50 mm. by 0.20 mm. with zooecia 0.46 by 0.26–0.30 mm. Frequently the peristomice of the ovicelled zooecia is somewhat wider than that of the other zooecia. The vibices are also very irregular; thay are salient, but disappear easily in fossilization.

Occurrence.—Pleistocene: Dead Mans Island off San Pedro (rare), Santa Monica (common), and Santa Barbara, California (very common).

Plesiotypes.—Cat. No. 68663, U.S.N.M.

Genus RHYNCHOZOON Hincks, 1891.

(For description, see Bulletin 106, U. S. National Museum, p. 506.)

RHYNCHOZOON VAUGHANI Canu and Bassler, 1919.

Plate 2, fig. 22; plate 4, figs. 1, 2.

1919. *Rhynchozoon vaughani* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 94, pl. 2, fig. 23; pl. 4, figs. 1, 2.

Description.—The zoarium is unilamellar. The zooecia are large, distinct, hexagonal or claviform; the frontal is smooth, convex, surrounded by a line of small scattered areolar pores. The apertura is large, suborbicular, with a wide proximal rimule; the peristomie is deep and widened; the very irregular peristome bears some large tubercles; the false rimule is compressed between two large tuberosities, one of which bears an oral avicularium transversely arranged.

Measurements.—$\text{Apertura}\begin{cases} ha = \ ? \\ la = 0.20 \text{ mm.} \end{cases} \qquad \text{Zooecia}\begin{cases} Lz = 0.60 \text{ mm.} \\ lz = 0.50 \text{ mm.} \end{cases}$

Affinities.—This species differs from *Rhynchozoon solidum* Osburn, 1914, which it much resembles, in its much larger micrometric measurements and in the absence of the small frontal avicularium.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (very rare).

Cotypes.—Cat. No. 68664, U.S.N.M.

RHYNCHOZOON CURTUM, new species.

Plate 4, fig. 14.

Description.—The zoarium is unilamellar. The zooecia are distinct, separated by a deep furrow, elongated, very *short*, much narrowed behind; the frontal is very small, somewhat convex, surrounded with aereolar pores; it bears a small elliptical transverse avicularium. The apertura, hidden at the bottom of the peristomie, is little visible; it bears a wide rounded rimule. The peristome is salient, wide, formed of tuberosities smooth or perforated; it is notched in its proximal part by a triangular pseudorimule placed in the median axis of the zooecium. The ovicell is small, short, deeply buried, recumbent convex and transverse.

Measurements.—Opercula $\left\{\begin{array}{l} ha = 0.14 \text{ mm.} \\ la = 0.16 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.40 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{array}\right.$

Affinities—This species differs from *Rhynchozoon verruculatum* Smitt, 1872, in its very short zooecia, in its elliptical and always acuminate avicularium, the length of which never surpasses 0.12 mm. In its general aspect the peristome appears to occupy half of the zooecium, which thus reduces considerably the length of the frontal and which gives such a short appearance.

Occurrence.—Miocene (Bowden horizon): Santo Domingo.

Holotype.—Cat. No. 68665, U.S.N.M.

RHYNCHOZOON GRANDICELLA, new species.

Plate 47, figs. 7, 8.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, *large*, elongated, elliptical. The frontal is a costulated pleurocyst surrounded by small areolar pores; it is covered by an avicularian chamber forming a truncated tongue above the apertura. The apertura is very oblique, transverse, with a wide proximal rimule. The peristomice is very oblique and bears an eccentric pseudorimule to the right or left of the avicularian mucro. The ovicell is small, globular, opening into the peristomie by a wide orifice. The ancestrular zooecia are smaller than the ordinary ones.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.15 \text{ mm.} \\ la = 0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.85\text{–}0.90 \text{ mm.} \\ lz = 0.60\text{–}0.70 \text{ mm.} \end{array}\right.$

Variations.—The apertura is visible only when the specimen is much inclined. The interareolar costules are little salient; on the zoarial margin they are visible only under special illumination.

Affinities.—This species differs from *Rhynchozoon longirostris* Hincks, 1881, also provided with large zooecia, in its dimensions greater than 0.70 mm. and in the absence of a frontal avicularium. It differs from *Rhynchozoon corrugatum* Thornely, 1905, also deprived of frontal avicularia in its much larger dimensions, in its interareolar costules, and in its ovicell wanting the two areas.

Occurrence.—Pleistocene: Rustic Canyon, Santa Monica, California (rare).

Cotypes.—Cat. No. 68666, U.S.N.M.

RHYNCHOZOON(?) LEVIGATUM, new species.

Plate 45, fig. 11.

Description.—The zoarium incrusts shells. The zooecia are distinct, elongate, ovoid, separated by a furrow; the frontal is very convex, *smooth* or very finely granular. The apertura is oval; the peristomice bears interiorly an excentric pseudolyrula; the peristome is thick and salient. The ovicell is globular, salient, attached to the peristome; its orifice is large, placed in the peristomie, and can not be closed by the operculum.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.12 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.50\text{–}0.75 \text{ mm.} \\ lz = 0.25 \text{ mm.} \end{array}\right.$

Affinities.—The excentric spinule in the peristome characterizes this species. It differs from *Schizoporella argentea* Hincks, 1882, in the absence of a large oral avicularium. The species differs from *Mucronella contorta* Busk, 1882, in its nonperforated frontal. It differs from *Rhynchozoon tuberculatum* Osburn, 1914, in the absence of scattered tuberosities on the frontal.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (very rare).

Holotype.—Cat. No. 68667, U.S.N.M.

RHYNCHOZOON VERRUCULATUM Smitt, 1872.

Plate 3, figs. 11–13.

1872. *Escharella verruculata* Smitt, Floridan Bryozoa, pt. 2, Kongl. Svenska Vetenskaps-Akademiens Handlingar, no. 4, p. 50, pl. 8, figs. 170–172.
1879. *Cellepora verruculata* Waters, On the Bryozoa of the Bay of Naples, Annals and Magazine of Natural History, ser. 5, vol. 3, p. 193, pl. 14, figs. 1–7.
1884. *Escharoides verruculata* Busk, Report on Polyzoa collected by the Challenger, vol. 10, pt. 30, p. 150.
1885. *Cellepora verruculata* Waters, On the use of the avicularian mandible, with additional list of the Naples fauna, Journal Royal Microscopical Society, ser. 2, vol. 5, pl. 14, fig. 37.
1902. *Cellepora verruculata* Calvet, Bryozoaires marins de la région de Cette, Travaux de l'Institut de Zoologie de L'Université de Montpellier, mem. 11, p. 66, pl. 2, figs. 6–9.
1902. *Cellepora verruculata* Calvet, Bryozoaires marins des côtes de Corse, Travaux de l'Institut de Zoologie de L'Université de Montpellier, mem. 12, p. 37.
1914. *Cellepora verruculatum* Osburn, Bryozoa of the Tortugas Islands, Publication Carnegie Institution of Washington, no. 192, p. 214.

Measurements.—Apertura $\left\{\begin{array}{l} ha = \ ? \\ la = 0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.45\text{–}0.50 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{array}\right.$

Variations.—The marginal zooecia are well oriented; the central zooecia are not, which has caused the species to be classified incorrectly in *Cellepora*. The frontal avicularium is transverse, much elongated, with triangular mandible. The peristome is lobed or crowned by from three to six tubercles. One of the two lips of the pseudorimule of the peristomice often bears a small avicularium. The irregularity of this species defies all description; the absence of limits between the zooecia appears to be the cause.

We are not entirely certain that the Mediterranean species is that of Smitt; the measurements taken from Calvet's figures appear larger.

Occurrence.—Miocene (Bowden marl): Bowden, Jamaica (rare). Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida (rare). Pleistocene: Simmons Point, Yonges Island, South Carolina (very rare).

Habitat.—Mediterranean at Naples, Cette, Corse. Atlantic: Gulf of Mexico and Tortugas Islands (24 meters). Indian Ocean: Heard Island (121 meters).

Plesiotypes.—Cat. No. 68668, U.S.N.M.

Family ADEONIDAE Jullien, 1903.

Genus ADEONA (Lamouroux, 1816) Levinsen, 1909.

(For description see Bulletin 106, U. S. National Museum, p. 560).

ADEONA POROSA Canu and Bassler, 1919.

Plate 6, figs. 22, 23.

1919. *Adeona porosa* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 94, pl. 6, figs. 22, 23.

Description.—The zoarium is free, bilamellar. The zooecia are little distinct, very elongate, separated by a hardly visible, salient thread; the frontal is *porous*, little convex, surrounded by areolar, parietal pores of which one is larger than the others. The ascopore is large, orbicular, median. The apertura and peristomice are semilunar with the proximal border somewhat concave. The gonoecia have two very large symmetrical, areolar pores and irregular, oral gibbosities. The avicularian zooecia have their opesia arranged on the lower part of a pyriform area, calcified and deep.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.12 \text{ mm.} \\ la \doteq 0.12 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.60 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{array}\right.$

Affinities.—As we possess only the figured fragment the study of this species is necessarily incomplete. The species is very peculiar, for there is no other one provided with a porous frontal and oral gibbosities at the gonoecia.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare).

Cotypes.—Cat. No. 68669, U.S.N.M.

ADEONA HECKELI Reuss, 1847.

Plate 24, figs. 1, 2.

1845. *Cellepora umbilicata* Lonsdale, Report Corals Tertiary formation North America, Quarterly Journal Geological Society, London, vol. 1, p. 507.

1847. *Cellepora heckeli* Reuss, Die fossilen Polyparien des Wiener Tertiarbeckens, Haidinger's naturwissenschaftliche Abhandlungen, vol. 2, p. 85, pl. 10, fig. 10.

1849. *Lepralia violacea* Johnston, A History of the British Zoophytes, p. 325, pl. 57, fig. 9.

1862. *Multiporina umbilicata* Gabb and Horn, Monograph of the fossil Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy of Natural Sciences of Philadelphia, ser. 2, vol. 5, p. 145, pl. 20, fig. 27.

1880. *Microporella violacea* Hincks, History of the British Marine Polyzoa, p. 216, pl. 30, figs. 1–4.

1889. *Microporella heckeli* Jelly, A synonymic catalogue of the recent marine Bryozoa, p. 184 (general synonymy).

1895. *Microporella (Heckelia) violacea* Neviani, Briozoi fossili della Farnesina, Paleontographia italica, vol. 1, p. 106, (30), pl. 5, (1), figs. 27–29.

1900. *Microporella heckeli* Calvet, Contribution a l'Histoire naturelle des Bryozoaires ectoprocts marins, Travaux de l'Institut de Zoologie de l'Université de Montpellier, mem. 8, pl. 7, fig. 1; pl. 8, fig. 15.

1901. *Microporella (Heckelia) violacea* Neviani, Briozoi neogenici della Calabrie, Paleontographia Italica, vol. 6, p. 177 (63), (local bibliography).

1902. *Microporella heckeli* Calvet, Bryozoaires marins de la region de Cette, Travaux de l'Institut de Zoologie de l'Université de Montpellier, vol. 2, mem. 11, p. 39.

1902. *Microporella heckeli* Calvet, Bryozoaires des côtes de Corse, Travaux de l'Institut de Zoologie de l'Université de Montpellier, vol 2, mem. 12, p. 20.

1904. *Adeonellopsis umbilicata* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 417, pl. 113, figs. 4, 5; pl. 114, fig. 5.

1905. *Microporella (Heckelia) violacea* Neviani, Briozoi fossili di Carrubare (Calabrie), Bolletino della Societa geologica italiana, vol. 23, p. 525.
1907. *Microprella heckeli* Calvet, Expédition scientifique du *Travailleur* et du *Talisman*, vol. 8, p. 404 (bibliography).
1909. *Adeona violacea* Levinsen, Morphological and systematic studies on the cheilostomatous Bryozoa, p. 83, pl. 14, fig. 1.
1909. *Reptadeonella violacea* Norman, The Polyzoa of Madeira and neighboring islands, Journal Linnean Society of London, vol. 30, p. 296.
1914. *Adeona violacea* Osburn, The Bryozoa of the Tortugas Islands, Florida, Publication No. 182, Carnegie Institution of Washington, p. 199.
1915. *Microporella heckeli* Barroso, Contribucion al conociementa de los Briozoos marinos de l'Espana, Boletin de la real sociedad espanola de Historia naturale, p. 415.
1917. *Adeona heckeli* Barroso, Notas sobre Briozoos, Boletin de la real sociedad espanola de Historia naturale, p. 498.
1919. *Adeona heckeli* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 1, p. 95.

This species is better known to zoologists under the name of *Microporella violacea* Johnston, 1849. In 1874 Reuss abandoned his right of priority because of his mediocre figure of 1847. Jelly, 1889, did not recognize his withdrawal of the name and authors have employed one or the other name according to their personal preference. On account of the size and position of the large frontal avicularium there has been created a variety, *plagiopora* Busk, 1859. Osburn, 1914, has shown that on the same specimen this avicularium may be straight or oblique and that it does not necessitate the establishment of a special variety.

The American fossil specimens are very rare; they belong to the normal form with straight avicularium, long since described by Gabb and Horn under the name of *Multiporina umbilicata*. Of this species we have found only a single specimen in the Bowden marl which is moderately well preserved. In the Duplin marl of the Upper Miocene, however, it is more common but not so abundant as in the European Miocene and Pliocene.

Occurrence.—Lower Miocene (Bowden marl): Bowden, Jamaica (rare). Lower Pliocene (Caloosahatchee formation): Shell Creek, De Sota County, Florida (common). Upper Miocene (Duplin marl): Wilmington, North Carolina; Natural well, 2 miles southwest of Magnolia, Duplin County, North Carolina; 3 miles southwest of Petersburg, and near Powcan, King and Queen County, Virginia (common).

Geological distribution.—Stampian of Germany (Reuss); Aquitanian of Gironde (Duvergier); Miocene of Australia (Waters); Helvetian of Italy (Seguenza), of Touraine (Canu); Tortonian of Austria-Hungary (Reuss), of Italy (Seguenza, Neviana), of England (Busk); Sicilian of Rhodes (Manzoni, Pergens), of Italy (Seguenza, Neviani); Quaternary of Italy (Seguenza, Neviani).

Habitat.—Mediterranean: Adriatic (32–89 meters), Naples (54 meters), Algeria, Cette (40–97 meters), Bonifacio (89–92 meters), Balearic Islands, shores of Spain. Atlantic: England, English Channel, Gulf of Gascony, Bay of Cadex (60–97 meters), Cape Verde Islands (118–180 meters), Madeira, Florida (56–97 meters), Tortugas (8–29 meters), Bermuda. Indian Ocean: Burmah. Pacific: Australia, China Sea and Cape Tizard (43 meters).

This species does not extend beyond the fifty-second parallel in Europe and the twenty-second in America. It is never abundant in any locality.

Plesiotypes.—Cat. Nos. 68670–68673, U.S.N.M.

Genus BRACEBRIDGIA MacGillivray, 1886.

(For description, see Bulletin 106, U. S. National Museum, p. 557.)

BRACEBRIDGIA DEFORMIS Canu and Bassler, 1919.

Plate 8, figs. 11–16.

1919. *Bracebridgia deformis* CANU and BASSLER, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 97, pl. 3, fig. 11–16.

Description.—The zoarium is free, bilamellar, compressed, bifurcated. The zooecia are distinct, elongate, separated by a deep furrow, claviform or elliptical; the peristomice is oval or elliptical; an oblique avicularium is buried in the peristomie; the apertura (visible only from the interior) is semilunar; the frontal is surrounded by areolar, parietal pores and on the zooecia it bears a large pore which does not perforate the wall.

Measurements.—Peristomice $\begin{cases} hpie = 0.15 \text{ mm.} \\ lpie = 0.12 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.45\text{–}0.60 \text{ mm.} \\ lz = 0.25\text{–}0.30 \text{ mm.} \end{cases}$

Affinities.—This species has the exterior aspect of an *Adeonellopsis*. The large frontal pore, however, is not a perforated area; it is invisible in the interior and its nature is unknown. The few specimens which we have studied were, it is true, rather poorly preserved. The peristomial avicularium is rarely visible at the exterior; it is on the contrary quite constant in the interior. This interior is that of *Bracebridgia;* it is therefore, indeed, in this genus that it must be classified, but it is a *deformed Bracebridgia*. The presence of a large frontal pore clearly characterizes this species and clearly differentiates it from the other known species of the same genus.

Occurrence.—Lower Miocene (Bowden marl): Bowden, Jamaica (rare).

Cotypes.—Cat. No. 68674, U.S.N.M.

Genus LAMINOPORA Michelin, 1842.

1842. *Laminopora* MICHELIN, Iconographie zoophytoolgique.

The apertura is very elongate; the anter is semielliptical; the poster bears a long, rounded rimule, two small cardelles separate the two latter parts; the operculum bears laterally two lateral denticles articulating on the cardelles. The frontal is a tremocyst with pores not starred. The gonoecia have no special form. Thirteen to fifteen tentacles.

Genotype.—*Laminopora contorta* Michelin, 1842.

Range.—Miocene–Recent.

Gemellipora arbuscula Calvet, 1907, belongs to this genus.

LAMINOPORA MIOCENICA, new species.

Plate 47, fig. 5.

Description.—The zoarium is bilamellar. The zooecia are distinct, separated by a deep furrow, elongated, oval, much narrowed behind, surrounded by a row of parietal dietellae; the frontal is convex, perforated by large pores; it bears a small elongated avicularium variable in form and in position. The apertura is long and narrow; the rimule is long and spear shaped.

Measurements.—Aperture $\left\{\begin{array}{l} ha = 0.15 \text{ mm.} \\ la = 0.06 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.65 \text{ mm.} \\ lz = 0.40\text{–}0.45 \text{ mm.} \end{array}\right.$

Affinities.—The present new species differs from *Laminopora contorta* Michelin, 1842, in the position of its avicularium below the aperture. It differs from *Laminopora arbuscula* Calvet, 1907, in the greater length of its apertura (0.15 and not 0.11 mm.), in its bilamellar zoarium and in its apertura not occupying two-fifths of the zooecial length.

The avicularium is very irregular, sometimes straight with the beak directed above, sometimes transverse, triangular, or elliptical.

Occurrence.—Miocene (Bowden horizon): Santo Domingo (very rare).

Holotype.—Cat. No. 68675, U.S.N.M.

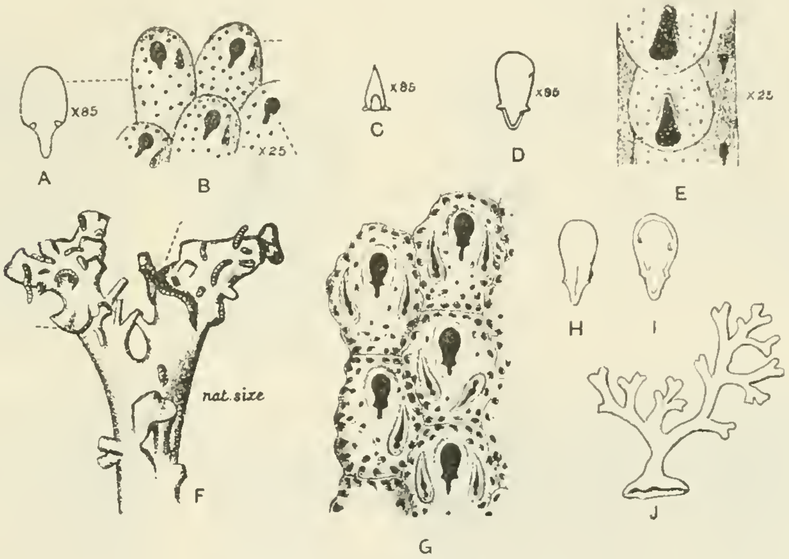


Fig. 28.—Genus *Laminopora* Michelin, 1842.

A–F. *Laminopora contorta* Michelin, 1842. A. Sketch of aperture, × 85, showing elongated sinus. B. Zooecia, × 25. C. Mandible, × 85. E. Lateral view of a zoarium showing large vicarious vibracula. F. Zoarium, natural size, illustrating branching at right angles after forming very short branches only. (A–F, after Waters, 1919.)

G–J. *Laminopora arbuscula* Calvet, 1902. G. Zooecia, × 45. H. Operculum, × 90, viewed on the outer side. I. Operculum, × 90, viewed on the inner side. J. Zoarium, natural size. (G–J, after Calvet, 1907.)

Genus ADEONELLOPSIS MacGillivray, 1886.

(For description, see Bulletin 106, U. S. National Museum, p. 563.)

ADEONELLOPSIS COCCINELLA, new species.

Plate 24, figs. 5–8.

Description.—The zoarium is bilamellar with small irregular fronds. The zooecia are distinct, little elongate, elliptical, little convex; the frontal is perforated by four to seven stellate pores. The apertura is terminal, semilunar, with a slightly concave proximal border; the peristome is thin, little salient, notched, and bears a small very inconstant supraoral avicularium. On each side of the apertura there are two small straight avicularia, without pivot, the point above.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.06 \text{ mm.} \\ la=0.04 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.40 \text{ mm.} \\ lz=0.20 \text{ mm.} \end{array}\right.$

Affinities.—This species is quite close to *Escharipora stellata* Smitt, 1872, a recent species off the coast of Florida, in the ensemble of its characters. It differs from it in the vertical direction of the oral avicularia, in the less low position of the latter, and in the much smaller number of frontal perforations. *Escharipora stellata* MacGillivray, a recent species from Australia, is not the species of Smitt, 1872, but it is undoubtedly of the same genus.

We are absolutely ignorant of the hydrostatic system of this group called *Escharipora* by Smitt, 1872. MacGillivray believed that it belonged to the Adeonidae. Levinsen considered the stellate pores as ascopores. It has seemed to us that one of our specimens had a gonoecium with transverse apertura, but it is necessary to await more detailed zoological study in order to classify this group of species.

Occurrence.—Lower Miocene (Chipola marl): Chipola River, Calhoun County, Florida (rare).

Cotypes.—Cat. No. 68676, U.S.N.M.

Genus ANARTHROPORA Smitt, 1867.

(For description, see Bulletin 106, U. S. National Museum, p. 430.)

Levinsen classified this genus doubtfully in the Escharellidae, where we also placed it in our monograph on the North American Early Tertiary Bryozoa. The absence of the ovicell, the nature of the frontal, and the analogy with certain species of *Adeonellopsis* indicate that the genus is better placed in the Adeonidae.

Family HIPPOPODINIDAE Levinsen, 1909.

Genus METRARABDOTOS Canu, 1914.

(For description, see Bulletin 106, U. S. National Museum, p. 533.)

METRARABDOTOS COLLIGATUM Canu and Bassler, 1919.

Plate 4, figs. 3–12.

1919. *Metrarabdotos colligatum* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 95, pl. 4, figs. 3–12.

Description.—The zoarium is free, bilamellar, *attached* to algae by a small, expanded base and bent upward like a crank; the fronds are large, bifurcated, but narrow. The zooecia are distinct, separated by a salient thread, long and narrow; the frontal is smooth, convex, surrounded by a line of large areolar pores often separated by short costules. The apertura is suborbicular; the peristomice is oval with a proximal pseudorimule. There are sometimes two quite inconstant, small, oral avicularia. The ovicell is endozooecial, enormous, borne by a considerably enlarged zooecium; its frontal is garnished with radiating and granulated costules.

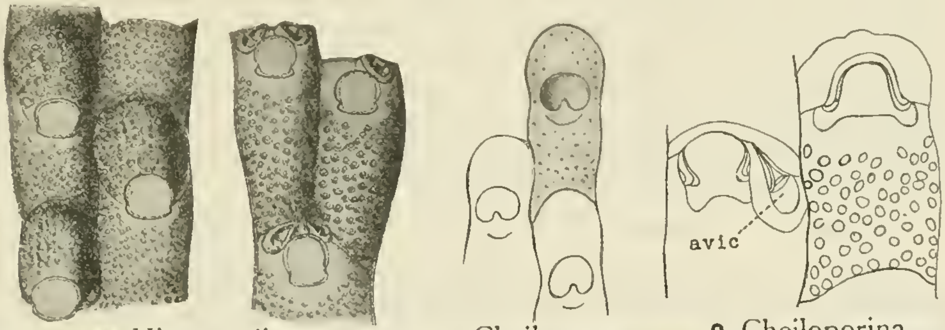
Measurements.—Young zooecia: Apertura $\begin{cases} ha = 0.14 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{cases}$

Zooecia $\begin{cases} Lz = 0.60 \text{ mm.} \\ lz = 0.28\text{–}0.30 \text{ mm.} \end{cases}$

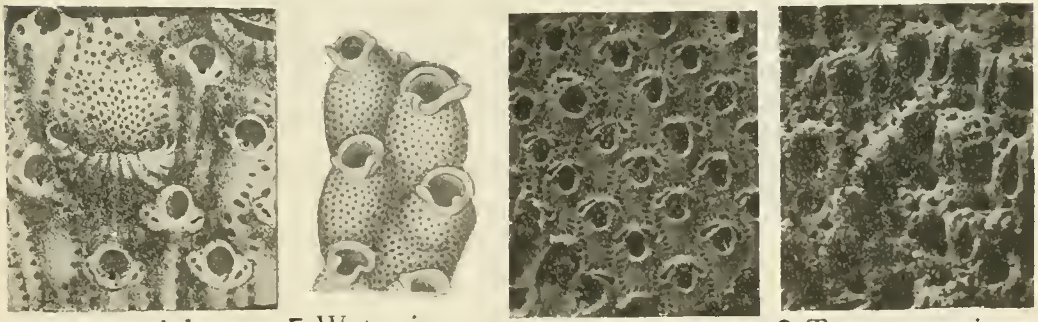
Old zooecia: Apertura $\begin{cases} ha = 0.24 \text{ mm.} \\ la = 0.16 \text{ mm.} \end{cases}$

Zooecia $\begin{cases} Lz = 0.70 \text{ mm.} \\ lz = 0.24\text{–}0.30 \text{ mm.} \end{cases}$

Affinities.—The genus *Metrarabdotos* contains more species in America than in Europe. The present species differs from *Metrarabdotos moniliferum* Milne-Edwards, 1836, common in the French Miocene, in its granulated costules on the ovicell, in the absence of a pseudolyrule at the peristomice, and in the absence of oral avicularia. It differs from *Metrarabdotos grandis* of the Vicksburgian, which also forms large fronds, in its greater zooecial width and in much less deep intercostular spaces



A. Hippopodina **B**. Cheilopora **C**. Cheiloporina



D. Metrarabdotos **E**. Watersipora **F**. Hippaliosina **G**. Tremogasterina

Fig. 29.—Genera of the Hippopodinidae Levinsen, 1909.

A. *Hippopodina* Levinson, 1909; H. *feegeensis* Busk, 1884, × 35. B. *Cheilopora* Levinsen, 1909; *C. sincera* Smitt, 1867, × 20, C. *Cheiloporina*, new genus; *C. haddoni* Harmer, 1902, × 44. D. *Metrarabdotos* Canu, 1914; *M. moniliferum* Milne-Edwards, × 25. E. *Watersipora* Neviani, 1895; *W. cucullata* Busk, 1853, × 35. F. *Hippaliosina* Canu; *H. rostrigera* Smitt, 1872, × 20. G. *Tremogasterina* Canu 1911; *T. horrida*, new species, × 20.

of the ovicell. The species is quite variable and we have figured the principal variations.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao and Rio Cana Santo Domingo (common).

Cotype.—Cat. No. 68677, U.S.N.M.

METRARABDOTOS LACRYMOSUM Canu and Bassler, 1919.

Plate 8, figs. 1–10.

1919. *Metrarabdotos lacrymosum* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 96, pl. 3, figs. 1–10.

Description.—The zoarium is free, bilamellar, bifurcated, narrow, with rectangular fronds, and fastened by a little expanded base. The zooecia are distinct, little elongate, rectangular, surrounded by large areolar pores more or less separated by the costules. The apertura is oblique, semielliptical, divided in front by a rounded and perforated sinus. The ovicelled zooecia are quite wide; the ovicell is endozooecial; it is little salient, finely punctate, and ornamented with interareolar costules. On each side of the apertura there are two large, triangular, salient avicularia with their point directed upward.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.18 \text{ mm.} \\ la = 0.14 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.70\text{–}0.74 \text{ mm.} \\ lz = 0.28\text{–}0.30 \text{ mm.} \end{array}\right.$

Affinities.—The characteristics of this species are the two large, oral avicularia which hang from each side of the apertura like two large *tears*. They are very irregular.

This species differs from *Metrarabdotos colligatum* from the same geological horizon, in its little expanded and nonprehensile base, in its nonclaviform fronds, and in the presence of large, oral avicularia. It differs from *Metrarabdotos moniliferum* Milne-Edwards, 1838, in its much less costulated ovicell and in the absence of a spine in the oral sinus.

Occurrence.—Lower Miocene (Bowden marl): Bowden, Jamaica (common).

Cotypes.—Cat. No. 68678, U.S.N.M.

METRARABDOTOS AURICULATUM, new species.

Plate 31, figs. 1–9.

Description.—The zoarium is bilamellar and formed of large, long, narrow, bifurcated fronds. The zooecia are distinct, separated by a salient thread, claviform; the frontal is narrow, little concave, surrounded by numerous areolar pores, separated by salient costules. The peristomice bears a rather deep proximal sinus at the base of which there are two lateral condyles limiting the orifice of the compensatrix; the apertura, buried at the base of the peristomice, is elliptical, a little elongated; the peristome bears two lateral avicularia. The ovicell is endozooecial, quite large; its superior wall is convex and costulate; its apertura is large and transverse.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.18 \text{ mm.} \\ la = 0.16 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.70\text{–}0.90 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{array}\right.$

Affinities.—This species differs from *Metrarabdotos colligatum* and from *Metrarabdotos lacrymosum* in its much larger zoaria and in its larger zooecial dimensions ($Lz > 0.70$ mm.). It differs from *Metrarabdotos moniliferum* Milne-Edwards, 1838, in the absence of a pseudolyrule in the peristomice.

The two large oral avicularia occur like two lateral ears; they are rather constant but often are diminished and partially buried by the activity of the calcification. In some rare cases they are replaced by a single supraoral avicularium.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (common). Pliocene (Caloosahatchee marl): Shell Creek, De Soto County (very common), and Monroe County, Florida (very common).

Cotypes.—Cat. Nos. 68679, 68680, U.S.N.M.

Genus HIPPALIOSINA Canu, 1918.

1918. *Hippaliosina* Canu, Hippaliosina, un nouveau genre de Bryozoaires, Bulletin de la Société géologique de France, ser. 4, vol. 18, p. 88.

The ovicell is endozooecial. The apertura is elongate, elliptical, divided into two parts by two triangular cardelles; the poster is smaller than the anter. The frontal is a granular pleurocyst surmounting an olocyst perforated laterally by areolar pores. There are usually two avicularia on each side of the apertura.

Genotype.—*Hippaliosina* (*Escharella*) *rostrigera* Smitt, 1872.

Range.—Rupelian-Recent.

The family Hippopodinidae is perhaps not a natural one, because the larva is not known. We classify here all the species in which the ovicell is endozooecial. Nevertheless, the genus *Hippaliosina* is undoubtedly very close to *Hippopodina* Levinsen, 1909, and *Cheilopora* Levinsen, 1909, which are characteristic of the family. It differs solely in the function of calcification; the tremocyst is replaced by a granular pleurocyst, accompanied by lateral areolar pores. *Metrarabdotos* Canu, 1914, presents also lateral areolar pores and a pleurocyst, but the hydrostatic function operates here through a vanna and not a rimule; moreover, the ovicells are totally different.

In addition to two new recent species from the Philippine Islands, the following species belong to this genus:

Hippaliosina (*Lepralia*) *depressa* Busk, 1852. Recent.
Hippaliosina (*Escharella*) *rostrigera* Smitt, 1872. Recent.
Hippaliosina (*Lepralia*) *clavula* Manzoni, 1871. Helvetian.
Hippaliosina brevirostris Canu, 1918. Recent.
Hippaliosina (*Hemeschara*) *sandbergeri* Reuss, 1869. Rupelian, Aquitanian.
Hippaliosina laxipora Canu, 1918. Miocene.

The genotype *Hippaliosina rostrigera* has been dredged near the twenty-second parallel a slight distance from the Tropic of Cancer, where it appears to have found its best conditions for existence. We can infer that the fossil species have lived under similar conditions and that their presence indicates likewise the vicinity of the Tropic. In this case their geologic distribution would indicate the displacement of this line through the ages, and consequently the contraction of the equatorial zone. Employing the known localities we have the following table for the Northern Hemisphere:

Species.	Geological distribution.	Latitude.
H. clavula	Helvetian of Italy	45°
	Pliocene of Rhodes	36°
H. sandbergeri	Aquitanian of Gironde	44°
H. rostrigera	Upper Miocene of Virginia	37°
	Upper Miocene of North Carolina	35°
	Lower Pliocene of South Carolina	33°
	Upper Pliocene of Florida	25°
	Recent of Florida	22°

The interpretation of this table indicates in a striking fashion the rapid and continuous descent of the Tropic toward the Equator. No species of the genus exists in the faluns of Touraine (forty-ninth parallel) situated without the equitorial zone. On the contrary, the Helvetian of Italy represented by *H. clavula* was nearer to it. This latter species does not exist in the more southern European Pliocene. *H. sandbergeri*, not being able to emigrate toward the south probably by the obstacle of a continental barrier, was exterminated in its place. It is probable that it will be discovered in more northern Oligocene deposits.

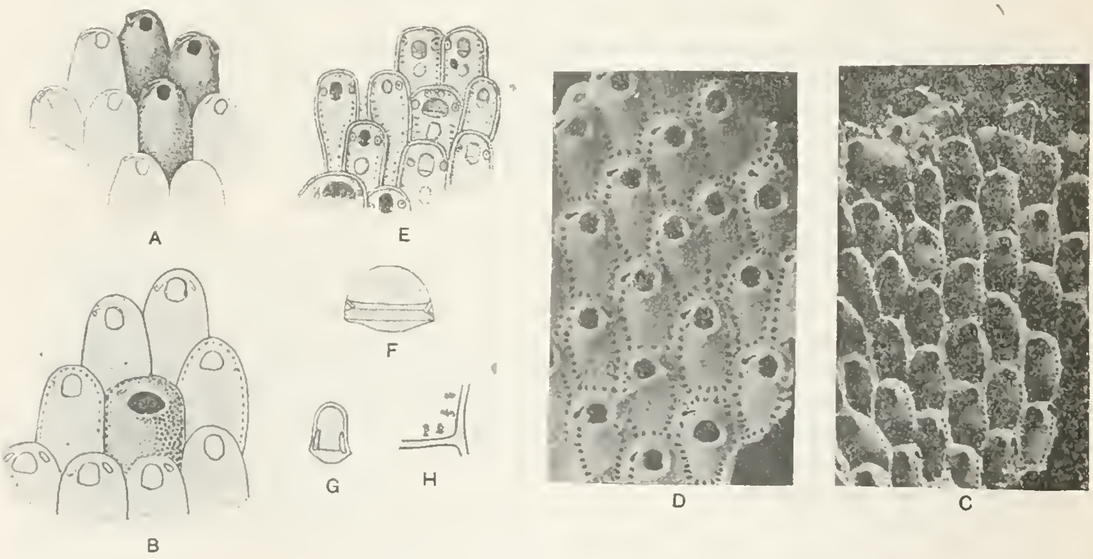


Fig. 30.—Genus *Hippaliosina* Canu, 1918.

A–C. *Hippaliosina rostrigera* Smitt, 1872. A. Ordinary zooecia. B. Group with an ovicelled zooecium. (A, B, after Smitt, 1872.) C. Interior of a fossil example. × 20.

D. *Hippaliosina sandbergeri* Reuss, 1869. An ovicelled specimen, × 25, from the Aquitanian of Leognan, France.

E–H. *Hippaliosina brevirostris* Canu, 1918. E. Ovicelled specimen, × 25. F. Operculum of the ovicelled zooecia, × 85. G. Operculum of ordinary zooecia, × 85. H. Areolar pores. × 85. (E–H, after Waters, 1889.)

For the Southern Hemisphere this phenomenon is less evident because of the imperfect geographic conditions. Although the fossil species *H. laxipora* has been observed along the thirty-fifth and thirty-sixth parallels, the recent species has been dredged only nearer the Equator from the thirty-fifth to the tenth parallels. The emigration northward toward the Equator appears thus to be a phenomenon as real as in the other hemisphere.

The bryozoa, on account of their method of life and their abundance in the marine currents, are generally rather cosmopolitan. It is remarkable that the genus *Hippaliosina* has been so sensitive to external variations, and this is a new phenomenon which merits recognition.

HIPPALIOSINA ROSTRIGERA Smitt, 1872.

Plate 17, figs. 15–17.

1872. *Escharella rostrigera* SMITT, Floridan Bryozoa, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol 11, p. 57, pl. 10, figs. 203–205.

1918. *Hippaliosina rostrigera* CANU, Hippaliosina, un nouveau genre de Bryozoaires, Bulletin de la Société géologique de France, ser. 4, vol. 18, p. 89.

Measurements (fossil specimens):

Apertura of ordinary zooecia: $ha = 0.15$ mm.; $la = 0.10$ mm.
Ordinary zooecia: $Lz = 0.44–0.55$ mm.; $lz = 0.30$ mm.
Apertura of ovicelled zooecia: $ha = 0.16$ mm.; $la = 0.16–0.17$ mm.
Ovicelled zooecia: $Lz = 0.50$ mm.; $lz = 0.38$ mm.

The ovicelled zooecia have an aperture larger and transverse and, moreover, of irregular form. Smitt has noted and has figured an elliptical aperture measuring 0.36 mm. in width. This variation must be rather rare, for we have only observed it on the fossil specimens from the Miocene near Yorktown, Virginia. In the Australian species the small ovicelled zooecia appear to be absent. The ovicelled zooecia should not be confounded with gonoecia. The latter do not contain a polypide, as the ovary alone occupies the interior cavity. The ovicell is little salient, little visible, but always apparent on our fossil specimens. The zooecia which bear them are larger.

This species has been dredged south of Florida in the vicinity of the Tropic of Cancer. The special location gives a clue to the contraction of the equatorial zone since the Oligocene period.

Geologic distribution.—Miocene (Yorktown formation): Yorktown, Suffolk, and 3 miles southwest of Petersburg, Virginia (common). Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina (common). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare). Pliocene (Caloosahatchee marl): Monroe County, Florida (rare).

Habitat.—South of Florida at a depth of 56 to 59 meters.

Plesiotypes.—Cat. No. 68681–68683, U.S.N.M.

Genus TREMOGASTERINA Canu, 1911.

1911. *Tremogasterina* CANU, Iconographie des Bryozoaires fossiles de l'Argentine, pt. 2, Anales del Museo Nacional de Buenos Aires, vol. 21 (sec. 3, vol. 14), p. 256.

The ovicell is concealed. The frontal is perforated by a large pore and surrounded by a line of areolar pores. The apertura is semielliptical. Avicularia between the apertures.

Genotype.—*Tremogasterina problematica* Canu, 1911.

Range.—Rocanean, Miocene.

In 1911 Canu discovered this remarkable and mysterious genus in the Rocanean strata of Argentina; that is to say, at the base of the Eocene. He noted the nature of the ovicell in his remarks that it opened in the interior of the zooecium. The single described species, *Tremogasterina problematiea*, is insufficiently preserved to serve as a genotype, and as the Miocene species here described are much better preserved, they will give a clearer idea of the genus. The form of the aperture indicates clearly the presence of a compensatrix. Therefore, it is rather probable that the enormous frontal pore is an ascopore.

TREMOGASTERINA HORRIDA, new species.[6]

Plate 24, figs. 3, 4.

Description.—The zoarium is free, bilamellar, with small distorted fronds. The zooecia are distinct, very elongate, elliptical, little regular, little convex; the frontal is perforated by a large, median orbicular pore, surrounded by a line of scattered areolar pores. The apertura is very large, elongate, semielliptical; it presents a slight constriction at the lower third, probably at the level of the articulations. The peristome is thick and tuberous. The ovicell is endozooecial, smooth, transverse, little salient; the apertura is of the same size as that of the ordinary zooecia. Between two apertures, on one or the other zooecium, there is an immense triangular avicularium, without pivot with the beak turned toward the top.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.18\text{–}0.20\text{ mm.}\\ la=0.14\text{ mm.}\end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.60\text{ mm.}\\ lz=0.30\text{ mm.}\end{array}\right.$

Opesium of the avicularium $\left\{\begin{array}{l} hav=0.14\text{ mm.}\\ lav=0.10\text{ mm.}\end{array}\right.$

Avicularium $\left\{\begin{array}{l} Lav=0.30\text{–}0.40\text{ mm.}\\ lav=0.24\text{ mm.}\end{array}\right.$

Affinities.—This species has a *disagreeable* aspect and its structure is difficult to understand. We have only found three small specimens and we have not been able to make a good dissection. The ovicell itself was not in condition to be photographed. If the frontal perforation is an ascopore, the apertura ought not to have an operculum moving on a special axis; this is not the case, the proximal border not being straight. This perforation corresponds perhaps to a special avicularium.

Occurrence.—Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (rare).

Holotype.—Cat. No. 68684, U.S.N.M.

CHEILOPORINA, new genus.

The ovicell is endozooecial; the apertura of the ovicelled zooecium is very large. The frontal is a tremocyst. The apertura bears two cardelles and the operculum is narrowed laterally at their level. No separation between the ovicell and the zooecium. Twenty-seven tentacles.

Genotype.—*Cheiloporina* (*Hippoporina*) *circumcincta* Neviani, 1896.

Range.—Jacksonian to Recent.

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[6] A second new species *Tremogasterina truncatorostris* is given on p. 244.

Historical.—In our monograph on the Early Tertiary Bryozoa we noted: "The genotype is deprived of cardelles. We think that the species having cardelles and a different operculum must be introduced into a new genus." Our manuscript was written in 1917. In 1918 Waters[7] stated that the operculum of *Cheilopora circumcincta* Neviani, 1896, is quite different from the operculum of the genotype *Cheilopora sincera* Smitt, 1867, and that these two species can not be maintained in the same genus. Under these conditions we are justified in creating the new genus *Cheiloporina.*

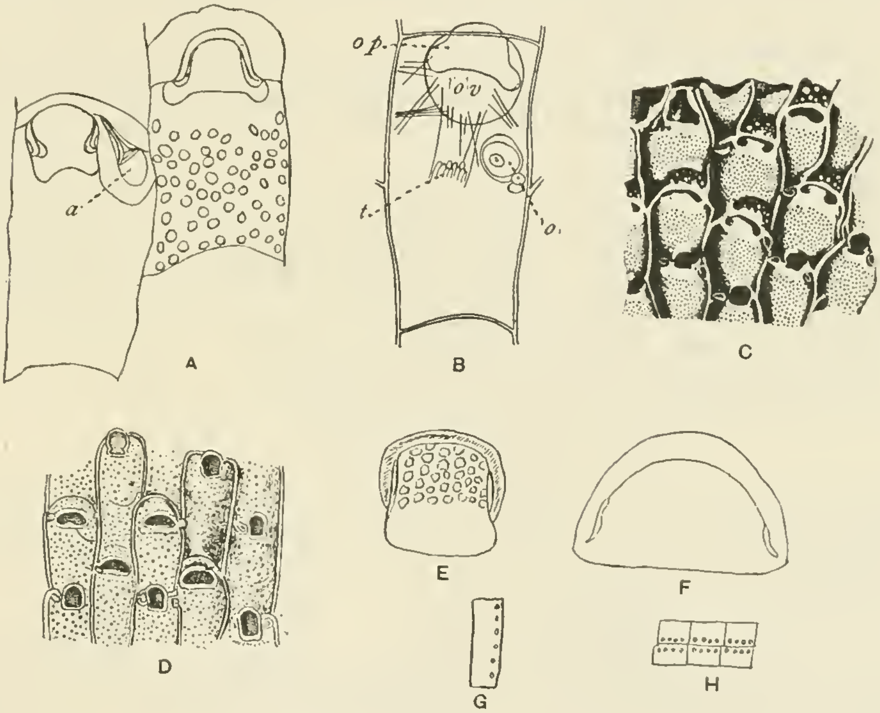

FIG. 31.—*Cheiloporina,* new genus.

A–H. *Cheiloporina* (*Cheilopora*) *haddoni* Harmer, 1902. A. Two zooecia, one ovicelled, showing an avicularium (*a*) and the two kinds of opercula. B. Basal view of zooecium with trifoliate operculum. (After Harmer, 1902), *op.* operculum; *t,* tentacles; o, ovary; *ov,* ovisac. C. Zoarium with ovicelled zooecia, × 25. (After Jullien, 1903.) D. Ovicelled zooecia, × 12. E. Operculum of ordinary zooecium, × 85. F. Operculum of ovicelled zooecia, × 85. G. Lateral wall showing septulae. H. Distal wall with septulae. (D–H, after Waters, 1918.)

All the species of *Cheilopora* described in the Monograph of North American Early Tertiary Bryozoa belong in reality to *Cheiloporina.* These are as follows: *Cheilopora labiosa* Ulrich, 1901; *Cheilopora orbifera; C. prelucidioides; C. strictocella; C. grandis; C. transversa; C. transveroides; C. specula;* and *C. sulcifera* Canu and Bassler.

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[7] On some Mediterranean Bryozoa, Annals and Magazine Natural History, ser. 9, vol. 11, p. 97, pl. 12, figs. 6–10.

Family TUBUCELLARIIDAE Busk, 1884.

Genus TUBUCELLARIA D'Orbigny, 1852.

(For description, see Bulletin 106, U. S. National Museum, p. 542.)

TUBUCELLARIA PUNCTULATA Gabb and Horn, 1862.

Plate 40, figs. 1–4.

1862. *Entalophora punctulata* GABB and HORN, Monograph Polyzoa Secondary and Tertiary formations of North America, Journal Academy Natural Sciences, Philadelphia, ser. 2, vol. 5, p 171, pl. 21, fig. 61.

Measurements.—Peristome, 0–30 mm. Peristomice, 0.18–0.20 mm. Zooecia $Lz = 1.20$–1.30 mm. $lz = 0.40$–0.50 mm.

Affinities.—This species is not entirely articulated; the segments are often ramified. The peristome sometimes bears one or two small avicularia. The frontal is a tremocyst with large pores.

The exterior aspect is rather deceiving and the older American authors classified the species in *Entalophora*. The bifurcation of the segments confirmed this reference but the longitudinal section proves their error (fig. 4). The ovicell is buried in the thickness of the peristomial walls; unfortunately we have not yet had the chance to section an ovicelled zoarium.

Occurrence.—Pleistocene: Santa Barbara (very common), Santa Monica (rare), and Dead Mans Island, off San Pedro, California (rare).

Plesiotypes.—Cat. Nos. 68686–68688, U.S.N.M.

TUBUCELLARIA PUNCTULATA, var. MINOR, new variety.

Plate 40, figs. 5, 6.

The micrometric measurements are smaller; the tremopores are smaller and more scattered.

Measurements.—Peristome, 0.24 mm. Peristomice, 0.14 mm. Zooecia $Lz = 1.20$ mm. $lz = 0.40$ mm.

The constancy of these small micrometric measurements obliges us to separate this variety from the well-known long-ago described species.

Occurrence.—Pleistocene: Santa Barbara (rare) and Santa Monica (Tremochal Canon), California (rare).

Holotype.—Cat. No. 68689, U.S.N.M.

Family PHYLACTELLIDAE Canu and Bassler, 1917.

Genus PHYLACTELLA Hincks, 1880.

(For description see Bulletin 106, U.S. National Museum, p. 573.)

PHYLACTELLA SPINOSISSIMA, var. MAJOR Hincks, 1884.

Plate 39, figs. 8, 9.

1884. *Mucronella spinosissima*, var. *major* HINCKS, Polyzoa of the Queen Charlotte Islands, Annals and Magazine Natural History, ser. 5, vol. 13, p. 53 (sep. 27); p. 213 (sep. 42).

Affinities.—In Miss Jelly's Synonymic Catalogue of Marine Bryozoa this species is considered a synonym of *Mucronella peachi*, var. *octodentata* Hincks, 1880. We believe this arrangement is erroneous because here the ovicell is recumbent and placed on the collar of the zooecium (necklike of Hincks), which is characteristic of the Phylactellidae. Neither do we believe that it is identical with *Mucronella spinosissima* Hincks, 1881, from Australia, and Hincks himself has noted some important differences. As we have not the material at hand for comparison we are adopting Hincks name of 1884, as our fossil is identical with the variety figured by him from the Queen Charlotte Islands.

The trace of numerous spines on the peristomice is quite visible on our fossils. We have not observed the tubular system noted by Hincks, but on many of the well-preserved zooecia we have observed the transformation of the tremopores into divergent tubules rather long and very little salient. There are eight spines on the peristome of the ovicelled zooecia.

This species differs from *Phylactella collaris* Norman, 1866, figured by Miss Robertson in 1908, in its ovicell of less width than the zooecium and smaller in its ensemble.

Occurrence.—Pleistocene: Santa Monica (Long Wharf Canyon), California (rare).

Habitat.—Pacific: Queen Charlotte Islands.

Plesiotype.—Cat. No. 68690, U.S.N.M.

Genus LAGENIPORA Hincks, 1877.

(For description see Bulletin 106, U. S. National Museum, p. 591.)

LAGENIPORA SPINULOSA Hincks, 1884.

Plate 40, fig. 7.

1884. *Lagenipora spinulosa* Hincks, Polyzoa of the Queen Charlotte Islands, Annals and Magazine of Natural History ser. 5, vol. 13, p. 57 (sep. 31), pl. 3, fig. 4; p. 210 (sep. 40), pl. 9, fig. 4.

1908. *Lagenipora spinulosa* Robertson, The incrusting Cheilostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 4, No. 5, p. 283, pl. 18, fig. 37.

Our figured specimen, much changed by fossilization, gives only a very poor idea of the beauty of this fragile species. The other specimens observed are equally poorly preserved, but there is no occasion to doubt their identity with this recent species.

Occurrence.—Pleistocene: Dead Mans Island, off San Pedro, California (rare).

Habitat.—Pacific: Off California.

Plesiotype.—Cat. No. 68691, U.S.N.M.

LAGENIPORA(?) BREVICOLLIS, new species.

Plate 24, fig. 9.

Description.—The zoarium incrust Cellepores. The zooecia are distinct, separated by a deep furrow, elongated, oriented, elliptical; the frontal is very convex and covered with tremopores. The peristome is incomplete, interrupted distally, little salient, much enlarged in its proximal portion. The apertura hidden at the bottom of the peristome bears cardelles placed very low, and an almost straight proximal border.

Measurements.—Apertura$\begin{cases} ha=0.10 \text{ mm.} \\ la=0.10 \text{ mm.} \end{cases}$ Zooecia$\begin{cases} Lz=0.50 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{cases}$

Variations.—There are sometimes on the peristome two very small avicularia symmetrically placed. We have not observed the ovicell, but the distal interruption of the peristome is a sufficient reason for our generic assignment.

This species differs from *Lepralia tenera* Reuss, 1867, in the presence of frontal tremopores.

Occurrence.—Miocene: Kuhns, Carteret County, North Carolina (rare).

Holotype.—Cat. No. 68692, U.S.N.M.

Genus **MASTIGOPHORA** Hincks, 1880.

(For description see Bulletin 106, U. S. National Museum, p. 586.)

MASTIGOPHORA PESANSERIS Smitt, 1873.

Plate 45, fig. 10.

1873. *Hippothoa pesanseris* Smitt, Floridan Bryozoa, pt. 2, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, No. 4, p. 43, pl. 7, figs. 159, 160.
1880. *Mastigophora dutertrei*, var. *pesanseris* Kirkpatrick, Polyzoa of Mauritius, Annals Magazine Natural History, ser. 6, vol. 1, p. 77.
1899. *Schizoporella pesanseris* Waters, Bryozoa from Maderia, Journal Royal Microscopical Society, p. 11, pl. 3, figs. 7, 8.
1905. *Mastigophora dutertrei*, var. *pesanseris* Thornely, Report on Polyzoa collected by Professor Herman at Ceylon in 1892, Ceylon Pearl Oyster Fisheries, Rept. Colonial Government, vol. 4, Suppl. Rep. No. 26, p. 117.
1909. *Schizoporella pesanseris* Waters, Marine Biology of Sudanese Red Sea, Journal Linnean Society London, vol. 31, p. 169.
1909. *Escharina pesanseris* Norman, Polyzoa of Maderia and neighboring islands, Journal Linnean Society London, vol. 30, p. 302, pl. 40, fig. 7.
1909. *Escharina pesanseris* Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 326, pl. 18, fig. 1.
1914. *Escharina pesanseris* Osburn, Bryozoa of the Tortugas Islands, Florida, Publication Carnegie Institution of Washngton, No. 182, p. 207.

The generic position of this species is still doubtful. According to the operculum, Waters classified it in the *S. cecili* group (*Arthropoma*); according to the form and position of the avicularia, Levinsen classified it in *Mastigophora* (*Escharina*). He believed that the ovicell is endozooecial. If this observation be verified it will be necessary to create a new genus for this species. Our specimen is incrusting a coral.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (rare).

Habitat.—Indian Ocean: Mauritius, Nanaar (55 meters), Siam, Gulf of Suez (Red Sea). Atlantic Ocean: Madeira (90 meters), Tortugas Islands (12–68 meters).

Plesiotype.—Cat. No. 68693, U.S.N.M.

MASTIGOPHORA GRANULOSA, new species.

Plate 3, fig. 4.

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, large, elongated, and swollen; the frontal is very convex, ornamented with numerous small pores and minute *granulations*. The aperture is small, somewhat elongated, and bears a wide rimule which is rounded and deep; the peristome is wide, very little salient, and bears spines. The two vibracula are salient and orbicular, the ovicell is small, convex, smooth.

Measurements.—Apertura $\begin{cases} ha = 0.15 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.60\text{–}0.75 \text{ mm.} \\ lz = 0.45\text{–}0.55 \text{ mm.} \end{cases}$

Affinities.—This species differs from *Mastigophora pesanseris* Smitt, 1872, in its larger micrometric measurements, in its frontal granules larger and more apparent, and in its vibracula placed at the level of the rimule.

Occurrence.—Miocene (Bowden marl): Bowden, Jamaica (very rare).

Holotype.—Cat. No. 68694, U.S.N.M.

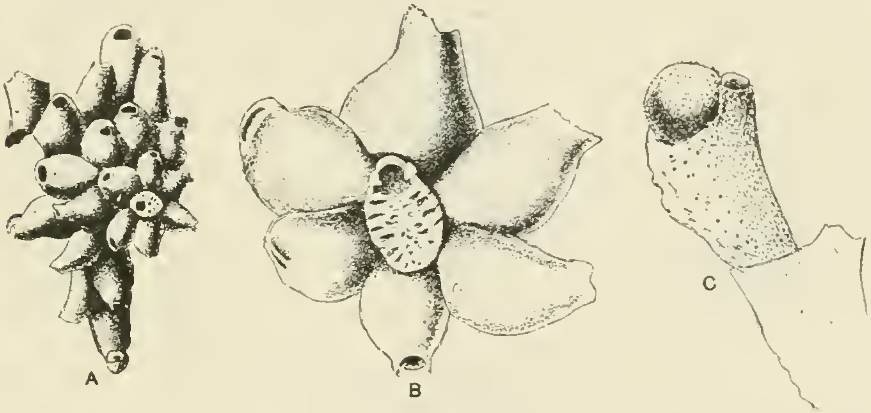

Fig. 32.—Genus *Temachia* Jullien, 1882.

A–C. *Temachia opulenta* Jullien, 1882. A. An incrusting specimen, × 8.5, from the Gulf of Gascony. B. Ancestrula and ancestrular zooecia, × 29. C. An ovicelled zooecium, × 29.

Genus TEMACHIA Jullien, 1882.

1882. *Temachia* Jullien, Dragages du *Travailleur*, Bulletin de la Societe de France, vol. 7, p. 510.

Zooecia suberect, dilated at the base and narrowed like the neck of a bottle above; peristome split anteriorly and deprived of spines; ovicell globular with the opening corresponding to the incision in the peristome. Zooecia of origin (ancestrula) with a frontal wall entire and lattice like, with two strong lateral spines at the level of the orifice. (Translation, after Jullien.)

Genotype.—*Temachia opulenta* Jullien, 1882. Recent.

Genus CREPIDACANTHA Levinsen, 1909.

1909. *Crepidacantha* Levinsen, Morphologic and Systematic Studies on the Cheilostomatous Bryozoa, p. 266.

The zooecia, whose aperture has strong hinge teeth and a compound, well-chitinized operculum, are in the proximal half provided with 9 to 12 very long marginal spines and 8 to 11 small uniporous pore chambers (dietellae) alternating as a rule with small intermediate chambers, each of which has an uncalcified spot (a marginal pore) in its roof. Two frontal vibracula without a crossbar. The hyperstomial, almost free ooecia, consist of two calcified layers, of which the ectooecium is provided with a number of pores. (Levinsen.)

Genotype.—*Crepidacantha poissoni* Savigny-Audouin, 1826. Recent.

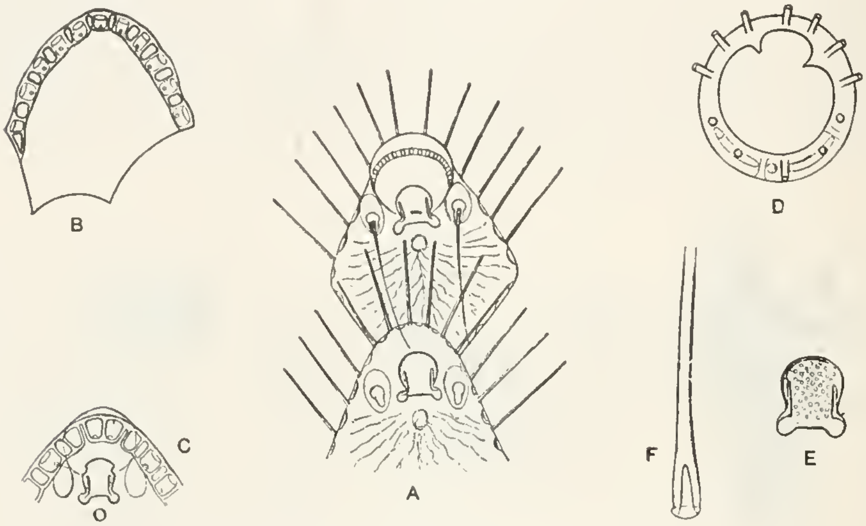

Fig. 33.—Genus *Crepidacantha* Levinsen, 1909.

A–F. *Crepidacantha poissoni*, var. *crinispina* Levinsen, 1909. A. Two zooecia, × 55. B. A zooecium seen from the basal wall. As in figure C, dietellae alternate with intermediate spaces, × 55. C. The distal part of a zooecium with ovicell, seen from the basal wall, × 55. D. An ancestrula of another variety of the same species, × 175. E. Operculum, × 140. F. The proximal part of the flagellum, × 200. (After Levinsen, 1909.)

Family CELLEPORIDAE Busk, 1852.

Genus HOLOPORELLA Waters, 1909.

For description, see Bulletin 106, U. S. National Museum, p. 604.

HOLOPORELLA ALBIROSTRIS Smitt, 1872.

Plate 7, figs. 9–14; plate 32, figs. 6–10.

1872. *Discopora albirostris* Smitt, Floridan Bryozoa, pt. 2, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, no. 4, p. 70, pl. 12, figs. 233–239.

1889. *Cellepora albirostris* Jelly, A synonymic catalogue of the Recent Miocene Bryozoa, p. 45 (Bibliography).

1914. *Holoporella albirostris* Osburn, Bryozoa of the Tortugas Islands, Publication 182, Carnegie Institution of Washington, p. 215.

1919. *Holoporella albirostris* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 97, pt. 1, fig. 19, pl. 7, figs. 9–14.

Measurements.—Apertura, $ha = 0.14$ mm.

$$\text{Zooecia}\left\{\begin{array}{l} Lz = 0.40\text{–}0.60 \text{ mm.} \\ la = 0.30 \text{ mm.} \end{array}\right. \qquad \text{Avicularium}\left\{\begin{array}{l} La = 0.60 \text{ mm.} \\ la = 0.40 \text{ mm.} \end{array}\right.$$

Variations.—The apertura is semilunar with a concave proximal border; it is indeed only constant in the interior (pl. 32, fig. 10). Exteriorly the peristomice is quite variable; it presents very frequently an excentric pseudosinus, as in the specimens dredged by the *Challenger* at Heard Island. This is occasioned by the very irregular development of a spiniform mucro. The latter is very fragile and never exists on our fossils; it is scarcely visible, and then only on the deep zooecia. The frontal is smooth and garnished laterally with very small areolar pores (pl. 32, fig. 8) which are rather easily obliterated (pl. 32, fig. 7). The interzooecial avicularium is spatulate; its distribution on the zoarium is very inconsistent.

The zoarium is always attached to algae; it creeps above or indeed completely around them to form masses of 3 centimeters in diameter. The depth at which it is dredged therefore gives no indication of its hydrostatic capacities if it is not living; the disappearance of the algae buries the zoarium in the depths where it did not live. The ancestrular zooecia are oriented (pl. 32, fig. 10) and the ancestrula emits five buds. The tuberosities observed on certain zoaria come from the greater development of certain zooecial groups.

Occurrence.—Oligocene (Emperador limestone): One-third mile north of Empire, Panama Canal Zone (rare). Oligocene (Anguilla formation): Southwest side of Crocus Bay, Anguilla, Leeward Islands (rare). Lower Miocene (Bowden marl): Bowden, Jamaica (very common). Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, and Monroe County, Florida (very common).

Geological distribution.—Miocene of Australia; Pliocene of New Zealand.

Habitat.—Atlantic: Off Florida (24–56 meters). Indian Ocean: Heard Island (121 meters). Pacific: Off Australia (to 13 meters).

Plesiotypes.—Cat. Nos. 68695–68697, U.S.N.M.

HOLOPORELLA PARVULA, new species.

Plate 24, figs. 10–13.

Description.—The zoarium is free, subcylindrical, irregularly branched. The zooecia are *very small*, heaped upon each other, irregular, provided with a small umbo before the apertura and surrounded by some areolar pores. The apertura is very small, semielliptical, transverse, surrounded by one to four small orbicular avicularia.

Measurements.—Apertura$\begin{cases} ha = 0.08 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{cases}$

Affinities.—In its general aspect this species may easily be confounded with *Holoporella maculata* Ulrich and Bassler, 1904, and with *Holoporella minuta*, new species. It differs from both of these in its free and cylindrical zoaria (and not attached to shells), and in the presence of the small avicularia which surround the apertura.

Occurrence.—Miocene (Duplin marl): Cape Fear River, 28 miles northwest of Wilmington, North Carolina (rare).

Holotype.—Cat. No. 68698, U.S.N.M.

HOLOPORELLA ROSTRIFERA, new species.

Plate 24, fig. 14.

Description.—The zoarium incrusts shells and forms small spiny masses. The zooecia are indistinct, erect; the frontal is convex, small, surrounded by a double row of areolar pores and often with costules directed toward the frontal rostrum placed in front of the apertura. The apertura is somewhat elliptical, elongated; the two small cardelles are placed in the lower third. Around the apertura there are four very salient *rostra* (0.30 to 0.40 mm.) terminated by a small, round avicularium without pivot. The ovicell is small, convex, not closed by the operculum and presents a very fragile orbicular frontal area.

Measurements.—Apertura $\left\{\begin{matrix} ha = 0.17 \text{ mm.} \\ la = 0.14 \text{ mm.} \end{matrix}\right.$

Affinities.—The present species differs from *Holoporella subturrita* in its rostra, which are free and not attached to the distal zooecium; in its frontal, which is not covered with tremopores; and in the presence of cardelles.

Occurrence.—Miocene (Yorktown formation): York River, Virginia (rare).

Holotype.—Cat. No. 68699, U.S.N.M.

HOLOPORELLA SUBTURRITA, new species.

Plate 25, fig. 9.

Description.—The zoarium incrusts shells, on which it forms small spinose masses. The zooecia are distinct, little erect, swollen; the frontal is convex and covered with tremopores. The apertura is elliptical, somewhat elongated, without cardelles. It is surrounded by four long rostra terminated by avicularia; the two distal rostra have their peduncles attached to the distal zooecium.

Measurements.—Apertura $\left\{\begin{matrix} ha = 0.16 \text{ mm.} \\ la = 0.14 \text{ mm.} \end{matrix}\right.$ Zooecia $\left\{\begin{matrix} Lz = 0.60\text{–}0.80 \text{ mm.} \\ lz = 0.36\text{–}0.40 \text{ mm.} \end{matrix}\right.$

Affinities.—With its long rostra this species much resembles *Holoporella turrita*, Smitt, 1872, from which it differs in the two distal rostra attached to the superior zooecium, in its tremopores, and in the absence of small nonpedunculate frontal avicularia.

Occurrence.—Miocene (Duplin marl): 28 miles northwest of Wilmington, North Carolina (rare).

Holotype.—Cat. No. 68700, U.S.N.M.

HOLOPORELLA HEMISPHERICA, new species.

Plate 3, figs. 9, 10.

Description.—The zoarium is free, small, *hemispherical*, about the size of a pea. The zooecia are large, distinct, heaped upon one another; the frontal is quite convex, smooth, surrounded by some large areolar pores. The apertura is semielliptical, transverse with a concave proximal border.

Measurements.—Apertura $\left\{\begin{matrix} ha = 0.17 \text{ mm.} \\ la = 0.15 \text{ mm.} \end{matrix}\right.$

Affinities.—As we have collected only a few specimens of this small species, it is difficult to study its variations or its affinities. It appears very well characterized by the simplicity of its structure and the large areolar pores which surround its broad frontal.

Occurrence.—Lower Miocene (Bowden marl): Bowden, Jamaica (rare).

Cotypes.—Cat. No. 68701, U.S.N.M.

HOLOPORELLA MASSALIS Ulrich and Bassler, 1904.

Plate 25, fig. 7.

1904. *Cellepora massalis* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 428, pl. 117, fig. 3, 4.

The original description by Ulrich and Bassler is as follows:

> Zoarium massive, composed of many layers, often nodose, always rough. Zooecia erect, very irregularly arranged, four or five in 2.0 mm.; orifice circular with a thin raised peristome. Generally the peristome of each zooecium bears upon its inferior side a prominent rostrum containing a large avicularium pointing obliquely upward and outward. Surface of zooecia, excepting the peristome, coarsely punctate. Ovicells not observed.

Measurements.—Apertura $\begin{cases} ha = 0.13\text{–}0.15 \text{ mm.} \\ la = 0.17 \text{ mm.} \end{cases}$

We have little to add to the description of Ulrich and Bassler and are only introducing a new photograph of the type specimen made on the same enlargement as the other species of this volume so as to better allow comparison. In the type we have observed a case of total regeneration which is very rare in the Cellepore bryozoa. This species differs from *Holoporella orbifera* in the very constant presence of a large frontal avicularium and in its smaller apertura.

Occurrence.—Miocene (St. Mary's formation): St. Mary's River, Maryland (rare). Miocene (Choptank formation): Greensboro, Maryland (rare). Miocene (Calvert formation): Chesapeake Beach and Plum Point, Maryland (rare).

Holotype.—Cat. No. 68702, U.S.N.M.

HOLOPORELLA ORBIFERA, new species.

Plate 25, figs. 3–6.

Description.—The zoarium is free, large, very irregular; it forms most often lobate or branched masses 2 centimeters in length. The zooecia are large, little distinct, erect; the frontal is smooth and surrounded by areolar pores. The apertura is very large, *orbicular*, without cardelles, with a concave proximal border. The oral avicularia are rare and inconstant. The interzooecial avicularia are large elliptical, with neither pivot nor denticles.

Measurements.—Apertura $\begin{cases} ha = 0.20 \text{ mm.} \\ la = 0.20\text{–}0.25 \text{ mm.} \end{cases}$

Affinities.—This species is very easily recognized by its large oral dimensions. It can be compared only with *Holoporella magnifica* Osburn, 1914, now living in the water off Florida, from which it differs in the absence of the small interzooecial avicularia. Osburn unfortunately has not indicated the enlargement of his figure.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (rare) and Harvey's Mills, Leon County, Florida (rare). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (common).

Cotypes.—Cat. Nos. 68703, 68704, U.S.N.M.

HOLOPORELLA(?) ECHINATA, new species.

Plate 25, figs. 1, 2.

Description.—The zoarium is a globuliform mass, more or less gibbose. The zooecia are large, salient, convex, smooth. The apertura is subcircular, the proximal border being very concave. There are two oral spines and a small oral very inconstant avicularium. On the deep zooecia the apertura only is visible.

Measurements.—Apertura $\begin{cases} ha = 0.15 \text{ mm.} \\ la = 0.15 \text{ mm.} \end{cases}$

Affinities.—This species differs from *Holoporella massalis* Ulrich and Bassler, 1904, in the absence of areolar pores. In the presence of two oral spines it approaches *Holoporella bicornis*, but differs from it in its larger micrometric dimensions and in the absence of areolar pores. It is also quite close to *Cellepora tuberosa* Smitt, 1872, in the presence of a small oral avicularium and in the nature of the frontal; it differs from it in the presence of two spines and in a very different zoarial form.

Only the figured specimen has been found. More plentiful material will later on permit a more exact study.

The absence of areolar pores may cause our generic determination to be doubted; but they are easily obliterated on the fossils.

Occurrence.—Miocene (Yorktown formation): Yorktown, Virginia (very rare).

Holotype.—Cat. No. 68705, U.S.N.M.

HOLOPORELLA BICORNIS, new species.

Plate 32, figs. 1–4.

Description.—The zoarium is formed of large shapeless masses attached to algae. The zooecia are erect, salient, very convex; the frontal is smooth, surrounded by some much-scattered areolar pores. The apertura is semilunar with a concave proximal border; the peristome is wide and bears two large spines. A small, salient avicularium terminates the median umbo. The deep zooecia have only their apertura visible. The interzooecial avicularia are rare and elliptical. Sometimes there is a vibraculum on the zooecia.

Measurements.—Apertura $\begin{cases} ha = 0.13 \text{ mm.} \\ la = 0.12\text{–}0.15 \text{ mm.} \end{cases}$

Affinities.—Above many of the apertures a little pore in the form of a lunar crescent is visible; it has the aspect of vibraculum; it is placed on the distal zooecium or indeed it is interzooecial. Its function is unknown.

This species resembles *Reptocelleporaria similis* Tuomey and Holmes, but the figure of these authors indicates a greater number of areolar pores. It differs from *Holoporella albirostris* Smitt, 1872, in the presence of two large oral spines and in the massive form of the zoarium. In each zoarium there is always a perforation which is the trace of the alga to which the zoarium was attached. This, moreover, is the most frequent habitat of the Celleporidae.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare).

Cotypes.—Cat. No. 68706, U.S.N.M.

HOLOPORELLA UMBONATA, new species.

Plate 40, figs. 8, 9.

Description.—The zoarium incrusts shells, bryozoa or algae. The zooecia are oriented, distinct, elongate, separated by a deep furrow; the frontal is convex, smooth, surrounded by pores and areolar costules; a large umbo terminated by an avicularium hides the apertura. The apertura is semilunar. The ovicell is globular, transverse, smooth; it is widely open in front of the *umbo* and never closed by the operculum.

Measurements.—Zooecia $\begin{cases} Lz = 0.50\text{–}0.60 \text{ mm.} \\ lz\ = 0.25\text{–}0.40 \text{ mm.} \end{cases}$

Affinities.—The interareolar costules are easily attenuated by fossilization and are visible only on the good specimens. The ancestrular zooecia are smaller and raised.

In its exterior aspect this species is close to *Cellepora pumicosa* Linnaeus, 1768; it differs from it in the presence of the interareolar costules and in a different form of the apertura.

Occurrence.—Pleistocene: Santa Barbara (rare) and Santa Monica (Temochal Canyon), California (very rare).

Cotypes.—Cat. No. 68707, U.S.N.M.

HOLOPORELLA TURRITA Smitt, 1873.

Plate 46, fig. 1.

1873. *Lepralia turrita* SMITT, Floridan Bryozoa, pt. 2, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, no. 4, p. 65.

1914. *Holoporella turrita* OSBURN, The Bryozoa of the Tortugas Islands, Florida, Publication Carnegie Institution of Washington, no. 182, p. 217 (bibliography).

Our specimen incrusts a coral. The apertura bears two small cardelles, placed in the lower third.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (very rare).

Habitat.—Waters off Florida (14–71 meters).

Plesiotype.—Cat. No. 68708, U.S.N.M.

HOLOPORELLA AVICULIFERA, new species.

Plate 46, fig. 2.

Description.—The zoarium incrusts corals, forming very thick masses. The zooecia are somewhat erect, convex, and formed of a tremocyst with scattered, spaced pores; the frontal bears some interareolar costules. The apertura is formed of a large anter and of a concave poster and arranged at the base of a short peristomie. There is a small avicularium in the peristomie. On the frontal some areolar pores are transformed into small orbicular avicularia.

Measurements.—Apertura $\begin{cases} ha = 0.18 \text{ mm.} \\ la = 0.20 \text{ mm.} \end{cases}$

Affinities.—This species presents somewhat the aspect of *Discopora pertusa* Smitt, 1872. It differs from it in the presence of the small disseminated avicularia and in the absence of oral mucro.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (rare).

Holotype.—Cat. No. 68709, U.S.N.M.

HOLOPORELLA MUCRONATA, new species.

Plate 46, fig. 7.

Description.—The zoarium incrusts sponges. The zooecia are little erect, surrounded by a line of large, spaced, areolar pores; the little salient, areolar costules meet at an enormous, wide, oral, very salient *mucro*. Two very small cardelles separate the anter from the concave poster. Some areolar pores are transformed into small orbicular or triangular avicularia.

Measurements.—Apertura $\begin{cases} ha = 0.13 \text{ mm.} \\ la = 0.15 \text{ mm.} \end{cases}$

Affinities.—The general aspect recalls a little that of *Holoporella janthina* Smitt, 1872. It differs from it in the presence of areolar pores, much scattered, and in the presence of the large oral mucro. The oral mucro does not exist on the young zooecia.

Occurrence.—Pleistocene: Mount Hope, Panama Canal Zone (very rare).

Holotype.—Cat. No. 68710, U.S.N.M.

Genus SCHISMOPORA MacGillivray, 1888.

(For description, see Bulletin 106, U. S. National Museum, p. 598.)

SCHISMOPORA BREVINCISA, new species.

Plate 32, figs. 11–13.

Description.—The zoarium incrusts shells. The zooecia are erect and heaped at the center and oriented on the margin; the frontal is formed by a granular pleurocyst surrounded by some large areolar pores. The apertura is oblique, semicircular, with a very *short*, rounded *rimule*. The interzooecial avicularium is elongate, elliptical; its opesium is very large, and its beak is quite rounded.

Measurements.—Apertura $\begin{cases} ha = 0.15 \text{ mm.} \\ la = 0.16 \text{ mm.} \end{cases}$

Variations.—The adventitions organs are quite irregular. Besides the large interzooecial avicularium without pivot, there are still some much smaller avicularia, almost orbicular or somewhat elongate and provided with a pivot. The medium umbo is always very short when it exists; it limits then an irregular slit which is a false rimule. The marginal zooecia are much elongated and sometimes almost cylindrical.

Affinities.—This species differs from *Discopora verruculata* Smitt, 1872, in the absence of a transverse avicularium on the frontal.

Occurrence.—Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida (common).

Cotypes.—Cat. No. 68711, U.S.N.M.

SCHISMOPORA ABRUPTA, new species.

Plate 40, figs. 10, 11.

Description.—The zoarium incrusts shells. The zooecia are indistinct, erect; the frontal is smooth and terminated by a mucro very little salient. The apertura is semicircular, with a wide rimule short and rounded. The ovicell is deeply embedded between the adjacent zooecia; it is transverse, smooth, convex; it is widely open in a locella limited by the medium umbo, and it can not be closed by the operculum. There are numerous, small, triangular avicularia with pivot disseminated between the apertures.

Measurements.—Apertura $\begin{cases} ha = 0.15 \text{ mm.} \\ la = 0.15 \text{ mm.} \end{cases}$

Affinities.—The apertura is rarely visible; it is always deeply embedded at the base of a sort of locella. The small avicularia are sometimes more developed; they elongate, become lanceolate, and lose their pivot. In spite of the lack of precision in its exterior characters this species is not very difficult to determine, thanks to the very special appearance of its avicularia.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Cotypes.—Cat. No. 68712, U.S.N.M.

SCHISMOPORA LANCEOLATA, new species.

Plate 40, figs. 12–15.

Description.—The zoarium formed of small lamellar masses creeps on algae. The zooecia are distinct, erect; the frontal is thick, convex, granular, and bears rarely some areolar pores; the medium umbo is terminated by a little salient avicularium. The apertura is semicircular; it bears a triangular sinus, wide and very short. The ovicell is wide, transverse, convex, smooth; it opens into the locella by a large orifice never closed by the operculum. The incomplete zooecia are very salient. The interzooecial avicularia are large, narrow, lanceolate; the pivot is formed by two denticles. The deep zooecia have their umbo very salient, but their frontal is buried.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.15 \text{ mm.} \\ la = 0.17 \text{ mm.} \end{array}\right.$

Affinities.—This species is quite easy to recognize by its lanceolate avicularia and its small zoarial lamellae. It differs from *Schismopora abrupta* in the absence of small triangular avicularia.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (rare).

Cotypes.—Cat. No. 68713, U.S.N.M.

Genus COSTAZZIA Neviani, 1895.

For description, see Bulletin 106, U. S. National Museum, p. 603.

COSTAZZIA ROBERTSONIAE, new species.

Plate 39, figs. 10–12.

Description.—The zoarium is formed of small, globular or cylindrical masses attached to algae. The zooecia are erect, very salient; the frontal is finely porous. The apertura is pyriform; it bears a wide rimule of little depth. On the peristome there are two small avicularia. The ovicell is small, much embedded between the adjacent zooecia; it bears a small semicircular area, garnished with some large pores. The interzooecial avicularium is small, oval, with very wide beak; it is traversed by a complete pivot.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.15 \text{ mm.} \\ la = 0.12 \text{ mm.} \end{array}\right.$

Affinities.—The frontal is almost always smooth. Its small frontal pores are only visible on the perfectly preserved zooecia because they became very easily closed by fossilization. This species differs from *Costazzia costazzi* Audouin, 1828, figured by Miss Robertson and still living in the Californian waters, in its much smaller ovicell.

We dedicate this species to Miss Alice Robertson, whose work on the Bryozoa of California has been a great addition to the science of bryozoology.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (rare).

Cotypes.—Cat. No. 68714, U.S.N.M.

Genus TEGMINULA Jullien, 1882.

1882. *Tegminula* JULLIEN, Dragages du *Travailleur*, Bryozoaires, Bulletin Société Zoologique de France, vol. 7, p. 510.

Zooecia urceolate, standing erect irregularly one by the side of another; orifice absolutely circular, surmounted by a tubular peristome partly open in front. (Translation after Jullien.)

Genotype.—*Tegminula venusta* Jullien, 1882. Recent.

Genus CELLEPORA Linnaeus, 1767.

We retain the ancient name *Cellepora* for those species, which at present can not be placed more definitely.

CELLEPORA MINUTA, new species.

Plate 25, figs. 10–13.

Description.—The zoarium incrusts in thick masses gastropod mollusks; it sometimes emits irregular and ramified branches. The zooecia are small, little distinct, poorly oriented, little erect; the frontal is little convex, more or less large, surrounded by a line of small areolar pores separated by short costules and formed of a pleurocyst detachable from the subjacent olocyst. The apertura is small, suborbicular; two small cardelles, almost median, separate the anter from the somewhat smaller poster. The incomplete zooecia are rare. A very salient small avicularium is between the apertures.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.08 \text{ mm.} \\ la = 0.07 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.35 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{array}\right.$

Affinities.—The phenomenon of symbiosis is characteristic of this species. It apparently can live only on a gastropod; we have not a single specimen fixed on any other substratum. The zoarium envelopes the mollusk and ends by killing it; it is rather regular and frequently presents tuberosities formed of raised zooecia. We always have trouble in understanding the selective faculty of the larvae; the latter can not really choose their substratum of fixation; is it therefore a biochemical reaction which permits them to subsist only on the shells of gastropods?

This species is quite close to *Cellepora maculata* Ulrich and Bassler, 1904, in its zoarium which affects the same phenomenon of symbiosis, in its small dimensions and the absence of deep zooecia. Confusion of the two is very easy, but the present species differs in the almost general presence of a single row of areolar pores and especially in the very constant occurrence of small interzooecial avicularia, which are tubular and very salient.

A sort of umbo, more or less salient, sometimes partially covers the poster. When we know the ovicell it will perhaps be necessary to place this species in a new genus.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (rare). Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (rare).

Cotypes.—Cat. No. 68715, U.S.N.M.

CELLEPORA MACULATA Ulrich and Bassler, 1904.

Plate 25, figs. 14–20.

1904. *Lepralia maculata* Ulrich and Bassler, Bryozoa Miocene, Maryland Geological Survey, p. 423, pl. 114, figs, 8, 9; pl. 118, fig. 7.

Ulrich and Bassler's original description follows.

> Zoarium beginning as a thin sheet on shells of small gastropoda to which other layers are added until masses as much as 2 inches in diameter result. Surface of masses generally exhibiting more or less distinct, usually elevated, clusters of zooecia slightly larger than those occupying the intermediate spaces. Zooecia convex, subovate, not sharply separated nor exhibiting any obvious plan of arrangement; when in rows about six occur in 2.0 mm. Orifice not terminal but situated in the anterior half, rounded and

expanded above, contracted below the middle, where there is a small denticle on each side, and nearly straight or curved slightly outward on the lower side; peristome simple, not elevated. Surface punctate excepting over a space just beneath the orifice that is smooth and elevated into a conical or obtuse umbo. Avicularia of two kinds and sizes, both sets very irregularly distributed. Those of the smaller set are ovate and less than half the size of the zooecial orifice, and situated in one of the corners of a zooecium; those of the larger set occupy each the place of a zooecium, have a triangular or acuminate ovate aperture considerably larger than the zooecial orifice, and have the pointed end or side strongly elevated. Ovicells immersed, somewhat smaller than the zooecia, convex, smooth centrally, punctate marginally, often with an eccentric, smooth oval space distinguished from the rest of the surface by an impressed line.

Further study of the types and other specimens show that the original description is perfectly exact. The aperture measures about 0.12 mm. by 0.08 mm. The frontal is garnished with a double row of areolar pores and with a detachable pleurocyst. Between the apertures there is sometimes a very small, round, nonsalient avicularium. The large interzooecial avicularium is very characteristic, but it is rather rare.

The zoarium developes into large nodose masses on gastropod shells. *Cellepora minuta* shows the same phenomenon of symbiosis and, although its other characters are close, its zooecia are also small and of such a kind that it is very difficult to distingush the two species. The present species differs, however, from *Cellepora minuta* in the absence of the small, very salient avicularium arranged between the apertures and by the great frequency of the double row of areolar pores. Moreover, the zoarium is larger and more spinous than that of *Cellepora minuta*. We have not yet discovered the ovicell.

Occurrence.—Miocene (Calvert formation): Plum Point and other localities in Maryland (common). Miocene (Yorktown formation): Yorktown, Virginia (rare). Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (very rare). Miocene (Duplin marl): Harvey's Mills, Leon County, Florida (very rare). Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina, and Muldrows Mills, 5 miles south of Maysville, South Carolina (rare).

Cotypes and Plesiotype.—Cat. Nos. 68716–68720, U.S.N.M.

CELLEPORA CRIBROSA Ulrich and Bassler, 1904.

Plate 25, fig. 8.

1904. *Cellepora cribrosa* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 429, pl. 117, figs. 5, 6.

The original description by Ulrich and Bassler is as follows:

Zoarium forming small irregular compressed masses. Zooecia very irregularly disposed, some erect, others prostrate, 0.5 mm. to 0.7 mm. long by 0.4 mm. to 0.6 mm. wide; surface strongly punctate; orifice rounded, the normal form showing a slight constriction a little below the middle, where a small tooth projects into the cavity from each side; peristome thick and more or less elevated, ringlike. Avicularia of moderate size, more or less acuminate ovate, attached to and projecting beyond the plane of the inferior side of the peristome; rarely absent. Ovicells few, known only in the broken condition in which they appear as deep semicircular excavations in front of the zooecial orifices.

Only the type specimen of this species has so far been discovered and we are unable to add anything to the original description or to place the species more accurately generically,

Occurrence.—Miocene (Calvert formation): Reeds, Maryland (very rare).

Holotype.—Cat. No. 68721, U.S.N.M.

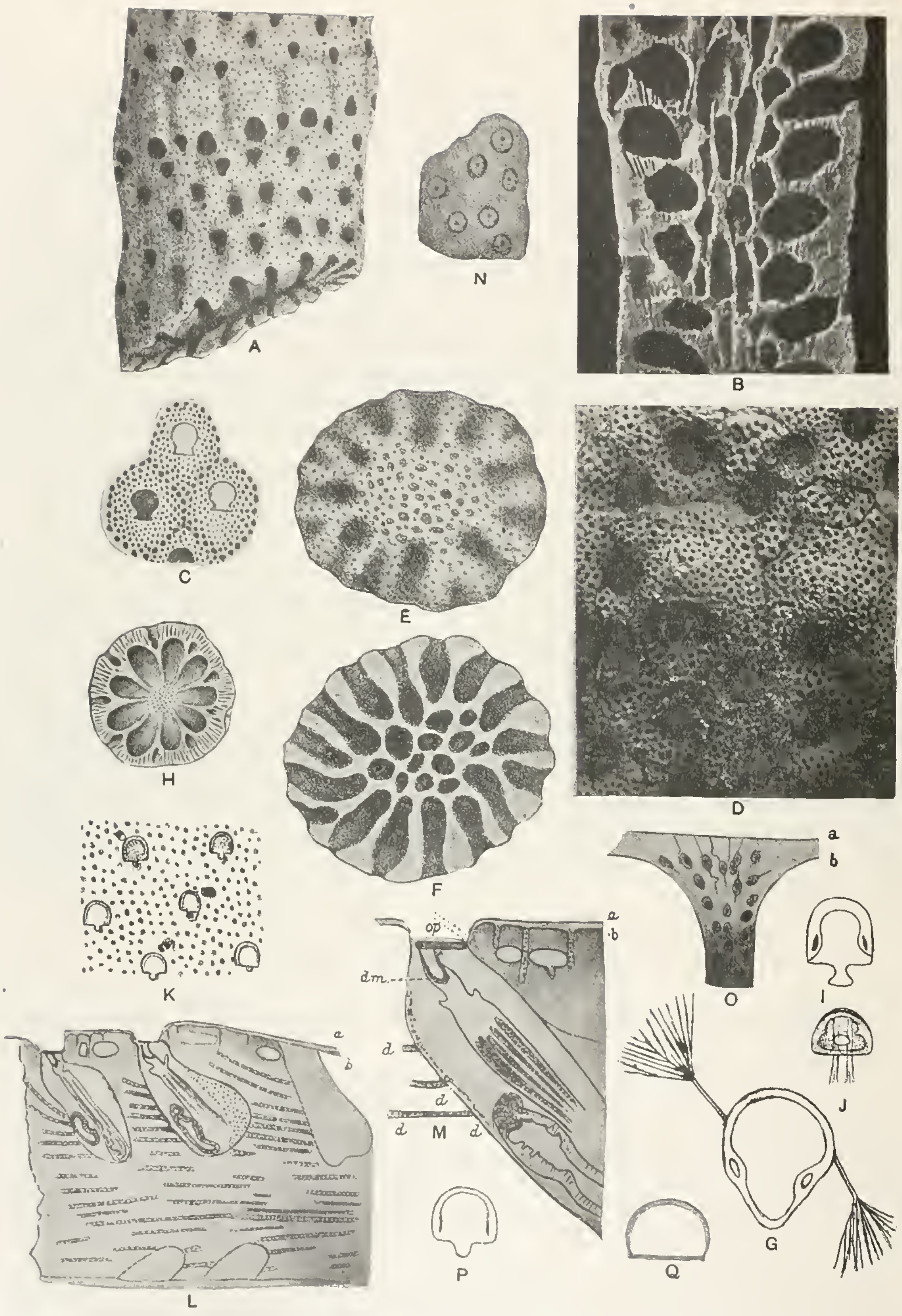
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Fig. 34.—Genus *Myriozoum* Donati, 1750.

A–G. *Myriozoum truncatum* Pallas, 1766. A. Portion of a fossil zoarium with ovicelled zooecia. (After Manzoni, 1875.) B. Longitudinal section, × 20, showing ovicelled zooecium in upper left corner. C. Details of the aperture. (After D'Orbigny, 1852.) D. Portion of a recent zoarium, × 20, with several ovicelled zooecia. The operculum closes the aperture. E. Extremity of a zoarium. F. Transverse section. (E, F, after Manzoni, 1877.) G. Operculum, × 85. (After Waters, 1878.)

H–J. *Myriozoum coarctatum* Sars, 1850. H. Transverse section. (After Smitt, 1868.) I. Operculum, × 85. J. Mandible, × 85.

K–O. *Myriozoum subgracile* D'Orbigny, 1852. K. Portion of a zoarium with avicularia, × 25. L. Section of tissue, × 25, showing the polypides in position, the covering integument (*a*=ectocyst) over the inner one (*b*); also the long pore tubes which in various places have a disk separating the contents on the two sides of the disk. The oral diaphragm is seen as withdrawn. M. Section through polypide, × 85, showing: *dm*, the diaphragm; *op*, the operculum, with dotted lines to show the position when partly open; *d*, disks in the pore tubes. N. Covering integument (*a*), × 85. O. End of pore tube, × 500, showing the covering integument (*a*) and the inner one (*b*). It contains some cellules of mesenchymatous tissue; P. Operculum × 85; Q. Mandible, × 50. (I–2 after Waters, 1900.)

Family MYRIOZOIDAE Smitt, 1868.

The frontal is thick and bears a tremocyst with tubules. Uniporous septulae or dietellae are present. The avicularia are adventitious and bear a pivot. The ovicell is hyperstomial not adjacent to the zooecium and lodged in a nichelike depression of the distal zooecium.

According to Levinsen the genera of this family are as follows:

Haswellia Busk, 1884 (referred to the Galeopsidae by us).
Gephyrophora Busk, 1884 (Galeopsidae).
Myriozoella Levinsen, 1909.
Myriozoum Donati, 1750.

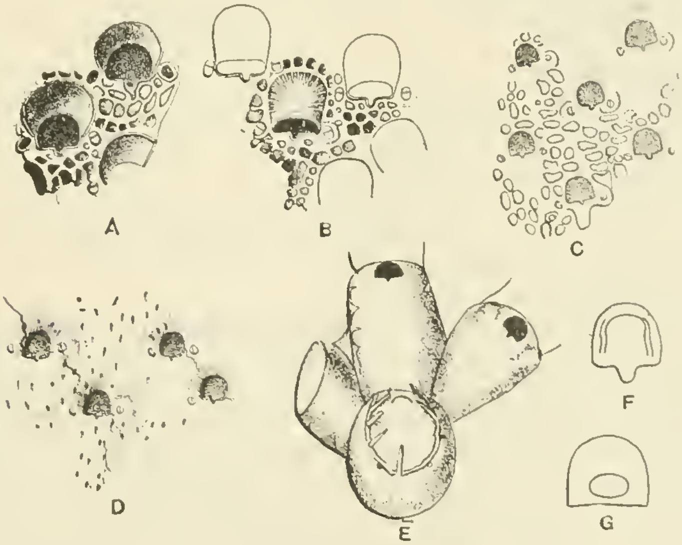

FIG. 35.—Genus *Myriozoella* Levinsen, 1909.

A–G. *Myriozoella crustacea* Smitt, 1868. A. Zooecia with peristomes and with cancellated frontal B. Zooecia showing the ovicell. C. Zooecia without peristome, × 26.5. (A–C, after Smitt, 1868.) D. Zooecia, × 26.5, much calcified, in which the frontal is not cancellated. E. Ancestrula and ancestrular zooecia, × 50. F. Operculum, × 85. G. Mandible, × 250. (E–G, after Waters, 1900.)

So far as known this family is not represented in the American Tertiary, but its species, on the contrary, are of common occurrence in the Miocene and Pliocene of Europe. The larva in all of these genera is unknown and their classification necessarily remains doubtful.

Genus MYRIOZOUM Donati, 1750.

1750. *Myriozoum* DONATI, Stagie della storia naturale dell' Adriatico.

The zoarium is free, cylindrical, and arborescent. Septulae are present. Sixteen tentacles.

Genotype.—*Myriozoum* (*Millepora*) *truncatum* Pallas, 1766.

Range.—Helvetian-Recent.

Genus MYRIOZOELLA Levinsen, 1909.

1909. *Myriozoella* LEVINSEN, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 297.

The zoarium is incrusting. Dietellae are present. Fifteen tentacles.

Genotype.—*Myriozoella* (*Myriozoum*) *crustacea* Smitt, 1868. Recent.

ORBITULIPORIDAE, new family.

The zooecia are regularly arranged vertically; the gemmation is lateral. The apertura is terminal. The ovicell is hyperstomial and forms a tube placed in a zooecium larger than usual.

The genera of this family are as follows:

Orbitulipora Stoliczka, 1861.
Stichoporina Stoliczka, 1861.
Batopora Reuss, 1867.
Mamillopora Smitt, 1872.
Sphaerophora Haswell, 1880.
Fedora Jullien, 1882.
Schizorthosecos Canu and Bassler, 1917.
? *Diplotaxis* Reuss, 1867.

Affinities.—This new family differs from the Conescharellinidae Levinsen, 1909, in the constant presence of an ovicell. It differs from the Myriozoidae in having the ovicell adjacent to a zooecium.

Historical.—In 1917 we included the genera of this new family with the Conescharellinidae Levinsen, 1909, but after a careful study of this latter family based upon specimens from the Philippine Islands we believe that the analogy between them is purely zoarial and that they must be separated. Their system of incubation is totally different, indicating that their larval system is also very different.

In 1885 Koschinsky discovered in the Bavarian Lutetian a series of forms which he classed in *Stichoporina* Stoliczka, 1881. This error has been repeated by Waters, Kirkpatrick, Neviani, and Canu. Calvet alone, in 1907, compared *Stichoporina* of authors with *Mamillopora* Smitt, 1872. In 1919 Waters established the truth of this observation by a study of some excellent specimens and classified the principal genera as follows:

A. With a pit: *Batopora*, *Orbitulipora*, *Sphaerophora*, *Stichoporina*.
B. Without a pit: *Mamillopora*, *Conescharellina*.

We have made only the few following changes in this classification. First, *Conescharellina*, provided with a peristomial ovicell, belongs to another family; second, we add the American genus *Schizorthosecos* as a valid genus in the first group; third, we believe it best to separate the group *Fedora* from *Mamillopora* until the type of the latter genus is better known.

The hydrostatic function of the central "pit" noted by Waters is unknown. On the inner side of *Schizorthosecos* and of *Mamillopora* there are hydrostatic cavities of different functions, for they are surmounted by ordinary but much smaller zooecia and there are many of them to a zoarium.

In this group the ancestrula engenders six zooecia and not five as in most other bryozoans. As a result of the studies of Waters in 1919 we have modified some of the generic diagnoses given in our monograph on the early Tertiary Bryozoa. The reader will find studies on the Conescharellinidae in our forthcoming monograph of the recent bryozoa from the Philippine Islands.

Genus BATOPORA Reuss, 1867.

1867. *Batopora* Reuss, Ueber einige Bryozoen aus dem deutschen Unteroligocän, Sitzungsberichte der K. Akademie der Wissenschaften, Wien, vol. 55, Abth. 1, p. 8.

With a pit toward which the zooecia are directed. Oral aperture small (0.09 mm.), nearly round, but examination shows straight lower edge. Bilaminate. Primary zooecia hidden (Waters). The frontal is a granular olocyst. The zoarium is conical, never hollow and formed of two superposed lamellae.

Genotype.—*Batopora stoliczkai* Reuss 1867 (probably young of *B. multiradiata* Reuss, 1869). Stampian, Tortonian.

The known species of the genus are:

Batopora rosula Reuss, 1847. Tortonian.
Batopora scrobiculata Koschinski, 1885. Lutetian.
Batopora conica Sequenza, 1880. Tongrian.
Batopora stoliczkai Reuss, 1867. Priabonian.
Batopora multiradiata Reuss, 1869. Priabonian.

Genus ORBITULIPORA Stoliczka, 1861.

1861. *Orbitulipora* Stoliczka, Oligocäne Bryozoen von Latdorf in Bernberg, Sitzungsberichte der k. Akademie der Wissenschaften, Wien, vol. 65, Abth. 1, p. 90.

With a pit toward which the zooecia are directed. Oral aperture large, with straight lower edge. Pit on the side bimultilayered (Waters). The frontal is a tremocyst. The zoarium is orbicular and formed of two layers placed back to back.

Genotype.—*Orbitulipora haidingeri* Stoliczka, 1861.

Range.—Bartonian, Tortonian.

The other known species of this genus are:

Orbitulipora (*Cellepora*) *petiolus* Lonsdale, 1850. Bartonian.
Orbitulipora excentrica Sequenza, 1879.
Orbitulipora lenticularis Reuss, 1869. Tongrian.

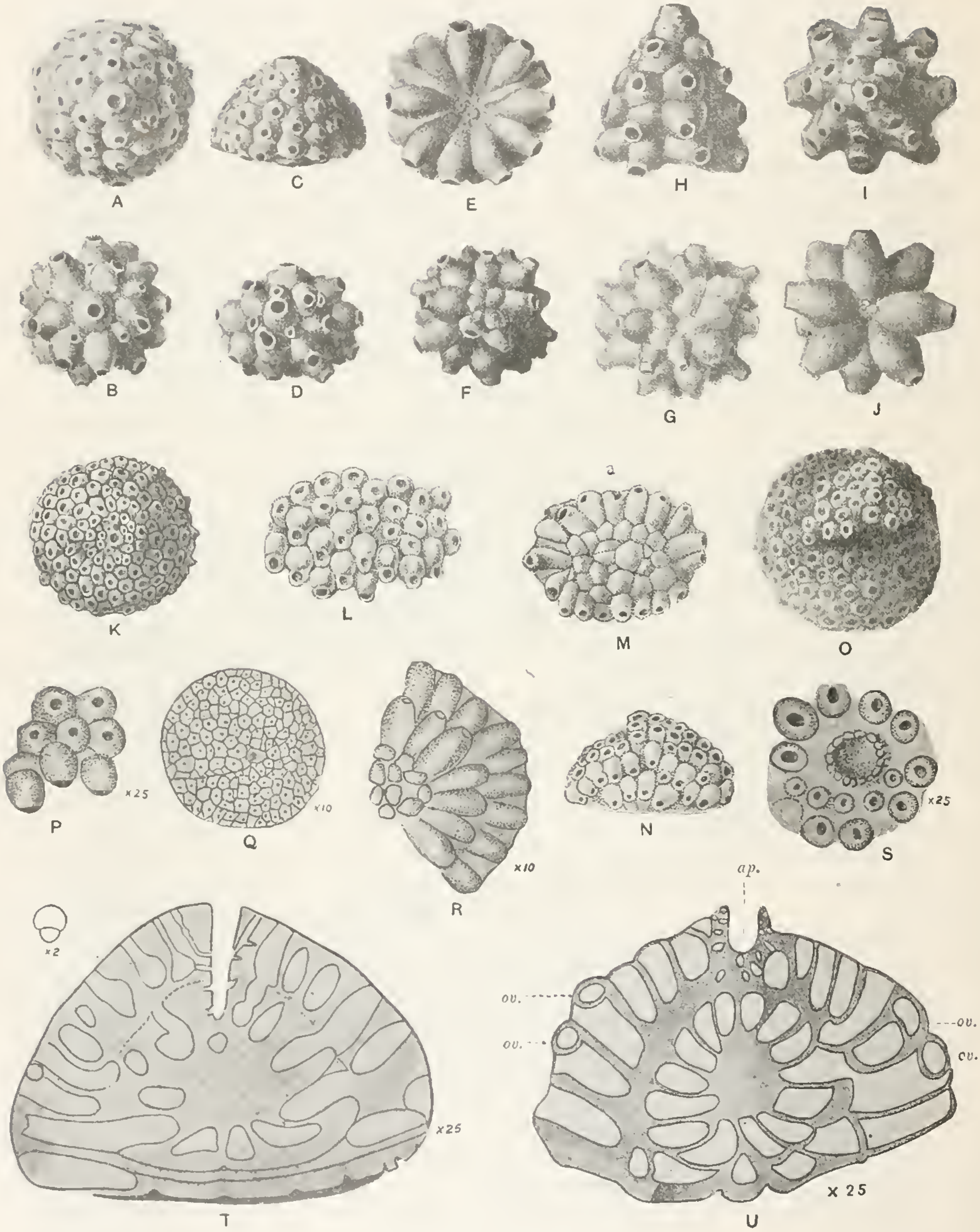
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FIG. 36.—Genus *Batopora* Reuss, 1867.

B, D, F, G. *Batopora stoliczkai* Reuss, 1867. Frontal, lateral, and basal views of the zoarium.

A, C, E, H, I, J. *Batopora rosula* Reuss, 1847. Frontal, lateral, and basal views of two specimens from the Priabonian. (A–J, after Reuss, 1867.)

K–U. *Batopora multiradiata* Reuss, 1869. K. Superior face of a colony showing the central pit. L, N. Groups of ovicelled zooecia. M. Inferior face of the colony K. O. Specimen showing a second layer. P. Group of ovicells, × 25. Priabonian at Montecchio-Maggiore, Italy. Q. Specimen from Val di Lonti, Italy (Priabonian), showing a second layer from the neighborhood of the pit, × 10. R. Base showing two circles of zooecia, × 10. S. Summit of a colony showing the pit with small zooecia around it as well as ordinary zooecia. T. Section showing the pit and the zooecia in a second layer around the first. From near Novezzina, Italy (Priabonian), × 25; *a*, zoarium showing a cap formed by a second layer of zooecia, from Montecchio-Maggiore, Italy (Priabonian). U. Meridian section showing the apical pit, the second layer and the ovicells. (After Waters, 1891.) *ap*, aperture; *ov*, ovicell.

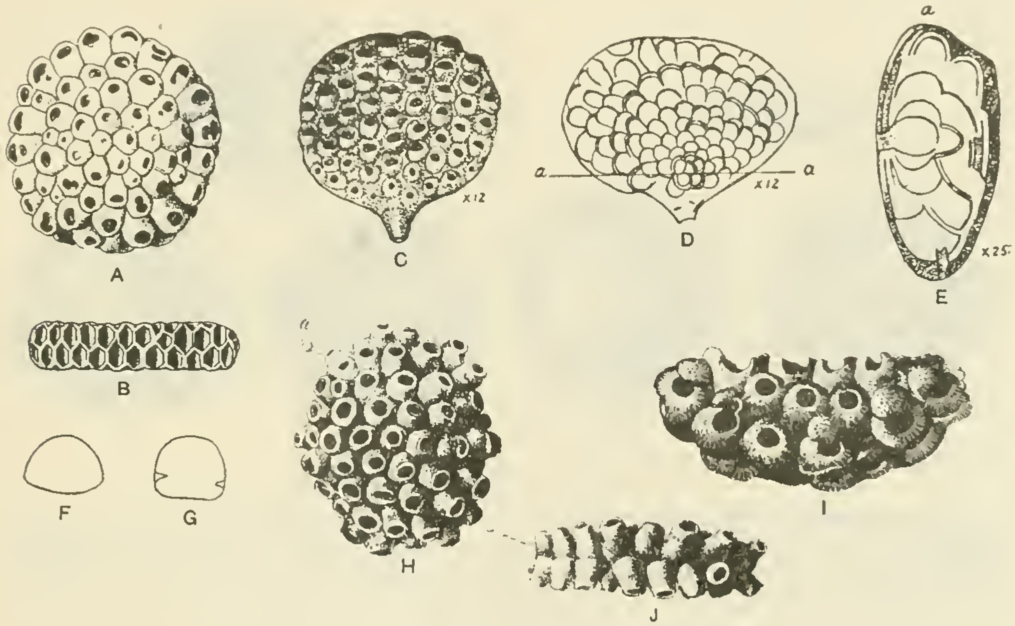

FIG. 37.—Genus *Orbitulipora* Stoliczka, 1861.

A, B, H–J. *Orbitulipora petiolus* Lonsdale, 1850. A. An entire zoarium from Latdorf. B. Transverse section showing the two lamellae placed back to back (A, B, after Stoliczka, 1851.) H. An entire bilamellar zoarium. I. Group of ovicelled zooecia. J. Lateral view of the same zoarium as H, showing the two lamellae. (H–J, after Reuss, 1867.)

C–E. *Orbitulipora excentrica* Seguenza, 1878. C. An entire zoarium showing a lateral pit, × 12. D. Meridian section showing the ancestrula surrounded by 5 zooecia, × 12. E. Transverse section following the line *a–a* at right angles to D, × 25.

F, G. *Orbitulipora lenticularis* Reuss, 1869. Oral apertures, × 85. (C–G, after Waters, 1919.)

Genus STICHOPORINA Stoliczka, 1861.

1861. *Stichoporina* STOLICZKA, Oligocäne Bryozoen von Latdorf in Bernberg, Sitzungsberichte der k. Akademie der Wissenschaften, Wien, vol. 65, Abth. 1, p. 92.

"With a pit towards which the zooecia are directed. Oral aperture small. Unilaminate to bilaminate? Pit central." (Waters.)

Genotype.—Stichoporina reussi Stoliczka, 1861.

Genus SPHAEROPHORA Haswell, 1881.

1881. *Sphaerophora* Haswell, On some Polyzoa from the Queensland coast, Proceedings Linnean Society New South Wales, vol. 5, p. 42.

"With a pit towards which the zooecia are directed. Oral aperture (0.12 mm.) with straight lower edge. Grows in all directions from the early zooecia. Pit central. Multilaminate." (Waters.)

Genotype.—*Sphaerophora fossa* Haswell, 1881.

Range.—Miocene, Recent.

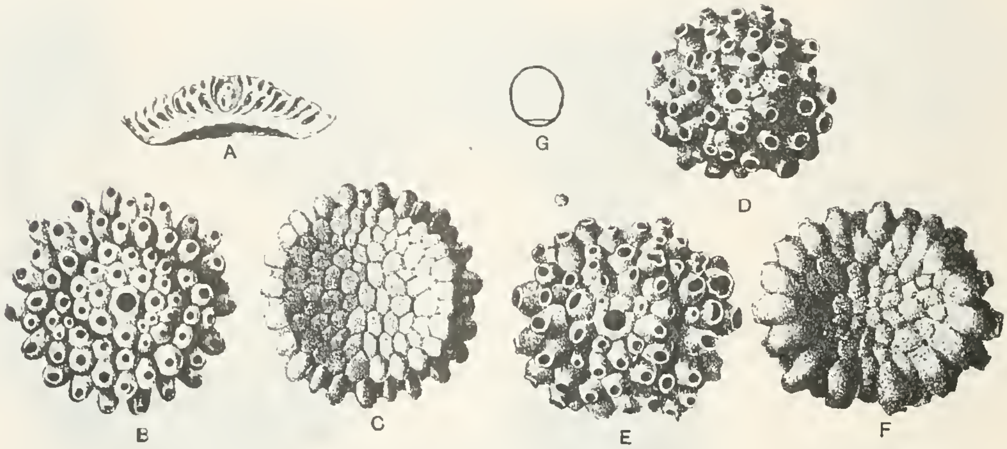

Fig. 38.—Genus *Stichoporina* Stoliczka, 1861.

A–G. *Stichoporina reussi* Stoliczka, 1861. A. Meridian section. B. Exterior side showing the central pit. C. Interior side of the same zoarium. (A–C, after Stoliczka, 1861.) D, E. Exterior side of colonies in which the central pit is surrounded by small zooecia. F. Interior side of E. (D–F, after Reuss, 1867.) G. Form of the orifice, × 85. (After Waters, 1919.)

Genus SCHIZORTHOSECOS Canu and Bassler, 1917.

1917. *Schizorthosecos* Canu and Bassler, A synopsis of American Early Tertiary Cheilostome Bryozoa, Bull. 106 U. S. National Museum, p. 74.

Completed definition.—With a pit closed externally by a perforated lamella. The zoarium is cupuliform. The apertura is oval with a rounded proximal rimule. There are numerous interzooecial zooeciules which may be transformed into avicularia, into radicular zooeciules or into compensation zooeciules.

Genotype.—*Schizorthosecos* (*Orbitolites*) *interstitia* Lea, 1833.

Range.—Claibornian, Jacksonian.

Genus FEDORA Jullien, 1882.

1882. *Fedora* Jullien, Dragages du *Travailleur*, Bulletin Société Zoologique de France, vol. 7, p. 17.

Without a pit. The ovicell is hyperstomial, not closed by the operculum, arranged between two zooecia. The apertura presents an anter and a poster separated by two salient cardelles; it is elongated on the ordinary zooecia but transverse and larger on the ovicelled zooecia. The frontal is a granular pleurocyst bordered by very small areolar pores. There are often one or two avicularia in the vicinity of the apertura. On the inner side the zooecia are hexagonal or fusiform, terminated by a small orbicular pore or covered with large pores.

Genotype.—*Fedora edwardsi* Jullien, 1882.

Range.—Lutetian to Recent.

The known species of this genus are as follows:

Fedora edwardsi Jullien, 1882. Recent (Atlantic).

Fedora (*Stichoporina*) *simplex* Kirkpatrick, 1890 (not Koschinsky, 1885). Recent (Indian Ocean).

Fedora (*Mamillopora*) *smithi* Calvet, 1907 (possibly *F. persimplex* Neviani, 1895). Recent (Atlantic).

Fedora (*Discoflustrellaria*) *dactylus* D'Orbigny, 1852. Lutetian.

Fedora (*Stichoporina*) *simplex* Koschinsky, 1885 (=*Stichoporina reussi* Canu, 1907). Lutetian.

Fedora (*Stichoporina*) *protecta* Koschinsky, 1885. Lutetian, Jacksonian.

Fedora (*Kionidella*) *excelsa* Koschinsky, 1885. Lutetian, Priabonian.

Fedora (*Stichoporina*) *crassilabris* Koschinsky, 1885. Lutetian.

Fedora (*Cupularia*) *bidentata* Reuss, 1869. (See Waters, 1919.) Priabonian.

Fedora (*Kionidella*) *obliqueseriata* Koschinsky, 1885. Lutetian.

Fedora (*Stichoporina*) *persimplex* Neviani, 1895. Plaisancian.

Fedora (*Lepralia*) *minutissima* Sequenza, 1880. Helvetian.

Genus **MAMILLOPORA** Smitt, 1873.

1872. *Mamillopora* Smitt, Floridan Bryozoa, pt. 1, Kongl. Svenska Vetenskaps Akademiens Handlingar, vol. 10, no. 11, p. 33.

Oral aperture large (0.12 mm.), contracted at each side. Primary zooecium erect, surrounded by six similar zooecia. Only unilaminate, showing the position of the zooecia on the under surface. (Waters.) The zoarium is cupuliform. The apertura is elliptical with two submedian cardelles. Avicularia are present. The ovicelled zooecia are much larger; their apertura is not transverse. The zooecia and their inner side are covered with tuberosities.

Genotype.—*Mamillopora cupula* Smitt, 1872.

The genotype of the genus is incompletely known.

We have had the good fortune to secure some recent specimens of *Mamillopora* dredged in the Gulf of Mexico. The species appears to be new, but it shows some interesting facts on the structure of the genus. It differs from *Mamillopora cupula* Smitt, 1872, in having a much smaller and nonbilobed ovicell, in the presence of a peristomial avicularium instead of an interzooecial one, and in having analogous apertures on the ovicelled zooecia. Our specimens were unfortunately insufficient for a complete study, but nevertheless we have observed the following points:

1. The ovicell is closed by the operculum. The operculum of the ovicelled zooecia is identical with the operculum of the other zooecia but often somewhat higher.

2. On the inner, noncellular (superior) side each tuberosity is a pyriform avicularium in which the opesium, which is elliptical and without pivot, bears a small semielliptical mandible. The mandibles are quite variable in dimensions, as some are small and others are large.

3. On the inner face there are large cavities which, as they are closed by the ectocyst, are indeed hydrostatic. We have not been able to make zoarial sections of such a nature that we can see by what mechanism the sea water enters or departs.

4. The mandibles of the oral avicularia are identical with those of the avicularia of the inner face.

5. The ovicells observed were marginal and not inserted between the other zooecia, but our specimens are insufficient to note if this is a constant character.

6. This species is very close in its dimensions to *Mamillopora tuberosa* Canu and Bassler, 1919, and differs only in the position of its ovicells and in the constancy of its oral avicularia.

We do not know the inner side of *Mamillopora smithi* Calvet, 1907. That of *Mamillopora cupula* Smitt, 1872, has not been figured, but Smitt speaks of "a thin layer of bladders (aborted avicularia) on the back of the zooecia," a description which appears to accord with our observation. Smitt's specimens were deprived of the ectocyst and he was not able to determine the true nature of the avicularia.

MAMILLOPORA TUBEROSA Canu and Bassler, 1919.

Plate 6, figs. 16–19; plate 7, figs. 1–8.

1919. *Stichoporina tuberosa* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, no. 291, p. 98, pl. 1, figs. 20–23; pl. 6, figs. 16–19; pl. 7, figs. 1–8.

Description.—The zoarium is free, conical, hollow, with very thick walls. The peristome is salient, ornamented with small tuberosities; it bears one or two small, elliptical avicularia with bar or denticles. The apertura is elliptical, elongated, hidden at the base of a short peristomie; it is formed of a large, semielliptical anter and of a small, concave poster, separated by two small, salient cardelles. The ovicell is large, somewhat salient, convex; it is hyperstomial and always closed by the operculum. A salient, elliptical avicularium, with two denticles serving as pivot, is placed at the base of each zooecium; it deforms the adjacent peristomes. The inner side is tuberose and bears very large pores arranged in quincunx. On the lower face there are large pores surrounded by very small ones.

Measurements.—Apertura $\left\{\begin{array}{l} ha=0.14 \text{ mm.} \\ la=0.10 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz=0.30 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{array}\right.$

Opesium of avicularium $\left\{\begin{array}{l} ho=0.10 \text{ mm.} \\ lo=0.06 \text{ mm.} \end{array}\right.$ Avicularium $\left\{\begin{array}{l} Lav=0.20 \text{ mm.} \\ lav=0.12 \text{ mm.} \end{array}\right.$

This is a very elegant species characterized by its peristomial *tuberosities*. The ancestrula is visible only in the interior of the zoarium; it is covered exteriorly by the first zooecia. All the zooecia are separated from each other by small canals which appear to end in the large, inferior pores. The oral tuberosities are hollow. The pores of the internal cavity are avicularia, of which the pivot is formed by two denticles; they are analogous with those of the external face (inferior). The internal face (and upper) bears also large cavities which we believe to be hydrostatic cavities; but it must be proved that the ectocyst is resistant enough to confine an equal amount of water. We must suppose also that these cavities are intended to counterbalance the irregularities of calcification and to assure the perfect equilibrium of the zoarial system.

This species must not be confounded with *Mamillopora cupula* Smitt, 1872. It differs from it in its ovicell, which is not bilobate, and in its ovarian zooecia which are not larger than the others.

Occurrence.—Lower Miocene (Gatun formation): Banana River, Costa Rica (common). Lower Miocene (Bowden horizon): Rio Cana, Rio Gurabo, and Cercado de Mao, Santo Domingo; Bowden, Jamaica (common).

Cotypes.—Cat. Nos. 68722–68725, U.S.N.M.

Order CYCLOSTOMATA Busk.

Family HETEROPORIDAE Pergens and Meunier, 1886.

Genus CERIOPORA Goldfuss, 1827.

(For description, see Bulletin 106, U. S. National Museum, p. 678.)

CERIOPORA VIRGINIANA, new species.

Plate 26, figs. 1–3.

Description.—The zoarium is an irregular globular mass. The tubes are polygonal; their walls are very thin. No peristomes.

Affinities.—This species may be compared only with the European species from the faluns of Touraine not yet published. Only the figured specimen has been found.

Occurrence.—Miocene (Yorktown formation): 1 mile northeast of Suffolk, Virginia (very rare).

Holotype.—Cat. No. 68726, U.S.N.M.

Family DIASTOPORIDAE Gregory, 1899.

Forma PROBOSCINA Audouin, 1826.

PROBOSCINA MESLERI, new species.

Plate 26, fig. 7.

Description.—The zoarium incrusts shells and forms long triserial branches dividing almost at a right angle. The tubes are long, convex, distinct, porous. The peristomie is perpendicular to the zooecial axis. The apertura is orbicular and the peristome is thin and sharp. The apertures are arranged in quincunx or trigeminal.

Measurements.—

Diameter of orifice	0.10 mm.
Diameter of the tubes	0.12 mm.
Diameter of aperture	0.40–0.50 mm.
Zoarial width	0.40–0.45 mm.

This species is named in honor of Mr. Rector D. Mesler, of the United States Geological Survey, who has made important collections of Miocene fossils for our study.

Occurrence.—Miocene (Duplin marl): Wilmington, North Carolina (rare).

Holotype.—Cat. No. 68727, U.S.N.M.

Forma BERENICEA Lamouroux, 1821.

BERENICEA FLABELLUM? Reuss, 1847.

Plate 27, fig. 17.

1847. *Diastopora flabellum* Reuss, Die fossilen Polyparien des Wiener Tertiarbeckens, Haidingers naturwissenschaftliche Abhandlungen, vol. 2, pl. 7, fig. 9.

The specimens from the Miocene of Virginia which we have referred doubtfully as above have the general zoarial aspect of Reuss's species, but without direct comparisons we are unable to assert their identity positively. The measurements of the American specimens are as follows:

Measurements.—

Peristome	0.24 mm.
Diameter of the orifice	0.18 mm.
Distance between the peristomes	0.80–0.90 mm.
Separation of the peristomes	0.80 mm.

Occurrence.—Miocene (Yorktown formation): Weavers Pond, Gloucester County, and 3 miles southwest of Petersburg, Virginia (rare).

Geological distribution.—Miocene of the Vienna Basin.

Plesiotype.—Cat. No. 68728, U.S.N.M.

ATELESOPORA, new genus.

Greek; Ateles, incomplete; in allusion to the lack of peristome.

The tubes are expanded and have no peristome.

This form of tubes was rather common in the Paleozoic era and during the Cretaceous, and it has been noted in many families. It is very rare in the Tertiary formations and in the recent seas, but its study has never been undertaken seriously.

Our generic definition is incomplete, since we are ignorant of the ovicell. In giving a generic name to this group, our main purpose is to call the attention of the zoologists to these singular remains of ancient periods.

ATELESOPORA REPTANS, new species.

Plate 26, figs. 4–6.

Description.—The zoarium creeps over shells, in salient masses, more or less flabelliform. The tubes are adjacent, irregular, polygonal. The zone of growth is thick and irregular.

Occurrence.—Miocene (Duplin marl): Muldrows Mills, 5 miles south of Mayville, Sumter County, South Carolina (rare); and Natural Well, 2 miles southwest Magnolia, Duplin County, North Carolina (rare). Miocene (Yorktown formation): 3 miles southwest Petersburg, 1 mile northeast, and 1 mile west of Suffolk, 1 mile west of Fort Nonsense, Gloucester County, and Beulahland, King and Queen County, Virginia (rare).

Cotypes.—Cat. Nos. 68729–68731, U.S.N.M.

Family MECYNOECIIDAE Canu, 1918.

Forma ENTALOPHORA Lamouroux, 1821.

(For remarks see Bulletin 106, U. S. National Museum, p. 734.)

ENTALOPHORA FASCICULIFERA, new species.

Plate 41, figs. 1-5.

Description.—The zoarium is free, cylindrical, with the Entalophora form of growth. The tubes are long, distinct, separated by a furrow, convex, and slightly striated transversely; at their extremity they are bent almost perpendicularly to the zoarium and are prolonged in a long, free peristomie; they are sometimes bigeminate. The peristomes are thin and widened.

Measurements:

Diameter of the little salient peristomes	0.14 mm.
Length of the peristomie	0.50 mm.
Diameter of the peristome at the extremity of the long peristomies	0.20 mm.
Diameter of the tubes on the zoarium	0.30 mm.
Distance between the peristomes	1.00 mm.
Diameter of the branches	0.80 mm.

Affinities.—The characteristic of this species is furnished by the presence of small bundles formed of two tubes partially joined by their peristomie. The species differs from *Mecynoecia proboscidea* Milne-Edwards, 1838, in its smaller micrometric dimensions and in the frequent presence of bigeminate zooecia.

Occurrence.—Pleistocene: Santa Monica (Tremochal Canyon) (rare), and Dead Mans Island, off San Pedro, California (very rare).

Cotypes.—Cat. No. 68732, U.S.N.M.

Family ONCOUSOECIIDAE Canu, 1918.

Forma FILISPARSA D'Orbigny, 1853.

FILISPARSA CLARKI, new species.

Plate 41, figs. 11-19.

Description.—The zoarium is free, compressed, bifurcated; the zooecia are placed on the anterior face; the dorsal is convex, striated longitudinally and transversally. The tubes are visible, convex, curved outward at their extremity and terminated by a rather long peristomie; the peristomes are thin, orbicular, arranged in quincunx or in oblique rows.

Measurements:

Diameter of the orifice	0.14 mm.
Diameter of the peristome	0.18–0.20 mm.
Zooecial diameter (on the zoarium)	0.24 mm.
Distance between the peristomes	1.00 mm.
Separation of the peristomes	0.76–0.80 mm.

Affinities.—In its general aspect this species is close to *Oncousoecia varians* Reuss, 1869; it differs from it in its smaller orifice (0.14 mm. and not 0.20–0.28 mm.) and in the arrangement of its tubes, which are much less regular. The number of longitudinal series of tubes is from three to four. Very rarely a dorsal apophysis is developed. Although we figure the ovicell we have not been able to place this species in its natural genus because the oeciopore has not been observed.

The specific name is in honor of Dr. F. C. Clark, of Los Angeles, California, who has collected many interesting species for our study.

Occurrence.—Pleistocene: Santa Barbara (very common), and Dead Mans Island, off San Pedro, California (rare).

Cotype.—Cat. No. 68733, U.S.N.M.

FILISPARSA CLARKI, var. PARVULA, new variety.

Plate 41, figs. 20–22.

Description.—The dimensions are smaller than in the typical form. The number of longitudinal series of tubes is five.

Measurements:

Diameter of the orifice	0.14 mm.
Diameter of the peristome	0.16–0.18 mm.
Zooecial diameter (on the zoarium)	0.20 (0.24) mm.
Distance between the peristomes	0.60–0.80 mm.
Separation of the peristomes	0.64–0.90 mm.

Variations.—The tubes are visible on the dorsal; their diameter there is 0.04 mm. Through fossilization they disappear and the dorsal appears more or less smooth; accidentally the latter may be transversally wrinkled.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Cotype.—Cat. No. 68734, U.S.N.M.

Family CRISIIDAE Johnston, 1847.

Genus CRISIA Lamouroux, 1816.

(For description see Bulletin 106, U. S. National Museum, p. 703.)

CRISIA SERRATA Gabb and Horn, 1862.

Plate 42, figs. 1–7.

1862. *Crisia serrata* Gabb and Horn, Monograph Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy Natural Sciences Philadelphia, ser. 2, vol. 5, p. 174, pl. 21, fig. 66.

1910. *Crisia pacifica* Robertson, Cyclostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 6, p. 242, pl. 20, figs. 16, 17.

Measurements.—

Diameter of the peristome	0.08–0.10 mm.
Distance between the peristomes	0.36–0.42 mm.
Zooecial diameter	0.12 mm.
Width of a segment	0.46 mm.
Diameter of the basis ramae	0.14–0.20 mm.

Variations.—This species, which has been known for a long time, is very common in the post-Pliocene formations of California. When the illumination is lateral, the segments present a longitudinal and median keel very characteristic. The distance between the tubes is smaller than the zooecial width. This character is always important to consider in the determination of species of *Crisia.*

For reasons of equilibrium there are usually two bases ramae to every segment, one on each side. However, it was not rare to find short segments having only one basis ramae.

The number of tubes per segment varies from 11 to 16.

Affinities.—There is a rather great difference between our photographs and the drawings given by Miss Robertson of *Crisia pacifica.* This difference of aspect is due to fossilization; the fossils lose their translucency and the tubes are then scarcely visible.

This species has the general aspect of *Crisia denticulata*, but differs from it in its larger micrometric dimensions, the distance between the peristomes being 0.40 mm. and not 0.30 mm.

Species of *Crisia* are attached to floating algae. The depth at which they are dredged has no bathymetric significance.

Occurrence.—Pleistocene: Santa Barbara (very common), and Santa Monica (very common), California.

Habitat.—Pacific: Off California (24–48 meters).

Plesiotypes.—Cat. Nos. 68735, 68736, U.S.N.M.

Family TUBULIPORIDAE Johnston, 1838.

Genus TUBULIPORA Lamarck, 1816.

(For description see Bulletin 106, U. S. National Museum, p. 753.)

TUBULIPORA FASCICULIFERA Hincks, 1884.

Plate 42, figs. 9–17.

1884. *Tubulipora fasciculifera* Hincks, Report on the Polyzoa of Queen Charlotte Islands, Annals and Magazine of Natural History, ser. 5, vol. 13, p. 206, pl. 9, fig. 6.

Measurements.—Diameter of the peristome, 0.12 mm.

Variations.—The fascicles are monoserial or biserial, very short, and composed of two to six tubes or more. The zoarium is generally flabelliform, more or less elongate; it creeps over algae. The ovicell is small, ramified between some fascicles only. The oeciostome is wide and little salient.

Affinities.—This species differs from *Tubulipora tuba* Gabb and Horn, 1862, in its very short fascicles, never composed of more than six tubes, and in its wide and little salient oeciostome.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Habitat.—Pacific: Off Queen Charlotte Islands.

Plesiotypes.—Cat. No. 68737, U.S.N.M.

TUBULIPORA TUBA Gabb and Horn, 1862.

Plate 42, figs. 18–23.

1862. *Semitubigera tuba* Gabb and Horn, Monograph Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy Natural Sciences Philadelphia, ser. 2, vol. 5, p. 169, pl. 21, fig. 57.

1910. *Tubulipora occidentalis* Robertson, Cyclostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 6, p. 249, pl. 22, figs. 29–31.

Measurements.—Diameter of the peristome, 0.12 mm.

Variations.—The zoarium creeps on algae, with generally flabelliform fronds: it sometimes entirely surrounds the delicate radicells and thus becomes tubular. We have observed some specimens on other bryozoa.

The fascicles are monoserial or biserial; they have a large number of tubes, from 6 to 20; they are often arranged on each side of the zoarial axis in rather irregular order.

The ovicell is large and is inserted between six or eight fascicles. The oeciostome is a very small tube, quite salient, adjacent to the first tube of a fascicle.

Affinities.—This species differs from *Tubulipora fasciculifera* Hincks, 1884, in its long fascicles composed of more than six tubes and in its long capillary oeciostome.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), (rare), Dead Mans' Island, off San Pedro (rare), and Santa Barbara (rare), California.

Habitat.—Pacific: Off California, and the Queen Charlotte Islands.

Plesiotype.—Cat. Nos. 68738, 68739, U.S.N.M.

Genus IDMONEA Lamouroux, 1821.

(For description, see Bulletin 106, U. S. National Museum, p. 770.)

IDMONEA DISPAR, new species.

Plate 41, figs. 6–10.

Description.—The zoarium is free, bifurcated, with subcylindrical section; the branches are undulated and at a bifurcation; they are not equal. The fascicles are alternate or almost opposite and diverge from each side of the median crest. The tubes are visible, convex, and three or four in number to a fascicle; the peristome is thin and orbicular.

Measurements.—Width of salient fascicles	0.14 mm.
Width of little salient fascicles	0.20 mm.
Diameter of first zooecium (on the zoarium)	0.18 mm.
Distance between the fascicles	0.40–0.60 mm.
Zoarial diameter	0.80 mm.

Affinities.—This species is quite well characterized by the inequality of the branches at the bifurcations; there is always one a little smaller than the other.

Occurrence.—Pleistocene: Santa Monica (Tremochal Canyon) ,California (common).

Cotypes.—Cat. No. 68740, U.S.N.M.

IDMONEA PLANULA, new species.

Plate 26, figs. 13–15.

Description.—The zoarium is free, wide, with semielliptical section; the dorsal is flat and striated transversally. The fascicles are salient, opposite, quite close but diverging from the median crest. The tubes are visible, separated by a little salient thread, and number three or four to a fascicle; the peristomes are thin and rectangular.

Measurements.—

Width of fascicles	0.20 mm.
Distance between the fascicles	0.40–0.60 mm.
Diameter (on the zoarium) of the first tube	0.24 mm.
Number of the tubes	3–4.
Width of the zoarium	1.20 mm.

Affinities.—This species has the general aspect of *Idmonea petri* D'Archiac, 1846. It differs from it in a greater distance between the fascicles (more then 0.40 mm.) and in the larger zoarial dimensions.

Occurrence.—Miocene (Choctawhatchee marl): Jacksons Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida (very rare).

Holotype.—Cat. No. 68741, U.S.N.M.

IDMONEA CALIFORNICA D'Orbigny, 1852.

Plate 43, figs. 1–9.

1852. *Idmonea californica* D'ORBIGNY, Paleontologie francaise, Terrains crétacés, vol. 5, Bryozoaires, p. 732.

1855. *Idmonea californica* CONRAD, Notes on Miocene and Post-Pliocene deposits of California, Proceedings Academy Natural Sciences Philadelphia, vol. 7, p. 441.

1862. *Idmonea californica* GABB and HORN, Monograph Polyzoa, Secondary and Tertiary formations North America, Journal Academy Natural Sciences Philadelphia, ser. 2, vol. 5, p. 168, pl. 21, fig. 56.

1910. *Idmonea californica* ROBERTSON, Cyclostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 6, p. 253, pl. 23, figs. 39–41 (bibliography).

Measurements.—

Diameter of the orifice	0.20 mm.
Diameter of the peristome	0.28 mm.
Width of the fascicles	0.28 mm.
Distance between the fascicles	0.80 mm.

Variations.—This giant species seems to be restricted to the American shores of the Pacific.

The fascicles are almost opposite. On the median axis there is a longitudinal row of isolated tubes, often closed by a calcareous diaphragm.

In tangential section the walls are perforated, but the perforations are no larger than in other species of *Idmonea* with small dimensions. In longitudinal section the zooecial walls appear very thick. In transverse section the tubes are rectangular. The ovicell is large, convex, placed on the median crest and finely porous. It surrounds the isolated zooecia of the median axis, which gives it the aspect of *Diaperoecia*, but it does not surround the fascicles and its interfascicular lobes are very short.

Occurrence.—Pleistocene: Santa Monica (rare), Dead Man's Island, off San Pedro (very common), and Santa Barbara, California (very common).

Plesiotypes.—Cat. Nos. 68742, 68743, U.S.N.M.

IDMONEA(?) EXPANSA Ulrich and Bassler, 1904.

Plate 26, fig. 8.

1904. *Idmonea* (?) *expansa* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 404, pl. 109, figs. 6–8.

The original description was as follows:

Zoarium adnate, beginning with a single zooecium to which others are added rapidly until an irregular flabellate expansion is produced that with further growth becomes more or less lobate. In the older examples the lobes are seen to be due to the development of the zooecia in systems composed of two pinnate series of transverse rows springing alternately from the opposite sides of a zigzag or wavy median line. In the rows the zooecial apertures, which are rounded quadrate in shape and elevated, are in contact, with four to six in each row and this greater number in about 0.8 mm. The furrows between the rows of apertures are often irregular, and where this in the case the rows themselves are not continuous. When the arrangement is normal the average width of the furrows is a little less than that of the rows of apertures, allowing about four of the latter to come within the space of 1.0 mm. The growing margins of the expansions are occupied by numerous crowded angular cells, decreasing in size toward the extreme edge. Zooecial walls minutely porous.

Occurrence.—Miocene (St. Mary's formation): Cove Point, Maryland (rare).

Cotypes.—Cat. No. 68744, U.S.N.M.

Genus CRISINA D'Orbigny, 1852.

CRISINA? STRIATOPORA Ulrich and Bassler, 1904.

Plate 27, figs. 1–4.

1904. *Crisina striatopora* Ulrich and Bassler, Bryozoa, Miocene, Maryland Geological Survey, p. 406, pl. 118, figs. 1–4.

Ulrich and Bassler's original description was as follows:

Zoarium erect, ramose, probably not exceeding 1 cm. in height, dividing dichotomously at intervals of about 1.5 mm.; branches subovate in cross section, thickest, uniformly convex and traversed longitudinally by from sixteen to twenty punctate striae on the reverse side, narrower and carrying alternating series of zooecial apertures on the obverse side. Zooecial apertures rarely three usually four in each series, in contact laterally, the inner one of each series largest, most prominent, and subcircular the outer one smallest, drawn out distally and apparently grading into the pores lying between the longitudinal ridges of the reverse side. Series of zooecia curving first forward then slightly backward, separated by a deep interspace averaging about 0.2 mm. in width; about five rows in 2.0 mm. Over the basal part of the zoarium the zooecial apertures are covered one after the other by the growth of the striato-punctate dorsal integument.

In order to properly classify this species thin sections and the nature of the ovicell are necessary. Additional specimens are needed before further studies upon it are made.

Occurrence.—Miocene (Choptank formation): Jones Wharf, Maryland (rare).

Holotype.—Cat. No. 68745, U.S.N.M.

Family THEONOIDAE Busk, 1859.

Genus THEONOA Lamouroux, 1821.

THEONOA GLOMERATA Ulrich and Bassler, 1904.

Plate 26, figs. 9–12.

1904. *Theonoa glomerata* Ulrich and Bassler, Maryland Geological Survey, Miocene, p. 406, pl. 109, figs. 4, 5.

The original description of this species was as follows:

> Zoarium cake shaped when young and growing irregular with age, the under side covered with a concentrically wrinkled epitheca, the upper side with short or broken irregularly arranged celluliferous ridges separated by deep interspaces. Ridges abruptly elevated, their flattened summits usually exhibiting a double row of subangular zooecial apertures. Here and there, probably through confluence of two or more ridges, considerable clusters of apertures occur, while other groups may not contain more than three or four cells. Occasionally an irregular radial arrangement of the ridges is apparent. About four zooecial apertures in 1.0 mm.

Occurrence.—Miocene (St. Mary's formation); St. Marys River, Maryland (rare).

Cotypes.—Cat. No. 68746, U.S.N.M.

Family DIAPEROECIIDAE Canu, 1918.

Genus STATHMEPORA Canu and Bassler, 1922.

Greek: stathme = line or cord. In allusion to the rectilinear form of the fascicles.

The ovicell is a vesicle traversed by the tubes of which the peristomes are much scattered. The tubes are cylindrical and grouped in linear, uniserial fascicles. Gemmation is triparietal.

Genotype.—*Stathmepora flabellata*, new species. Pleistocene.

STATHMEPORA FLABELLATA, new species.

Plate 43, figs. 10–17.

Description.—The zoarium is bushy and formed of bilamellar, *flabellate* fronds. The fascicles are uniserial, little salient, arranged perpendicularly to the zoarial margins. The tubes are visible only when they are isolated. The ovicell is an irregular vesicle pierced by fascicles whose tubes are then more adjacent.

Measurements.—

Diameter of the peristome	0. 12 mm.
Zooecial diameter	0. 18 mm.
Distance between the peristomes	1. 00 mm.
Separation of the peristomes	0. 56–0. 80 mm.

Variations.—The fascicles are not exactly analogous to each other. They form, moreover, some lines with tubes adjacent like true fascicles. The basal lamella is large and the zone of growth is thick.

The ovicell is formed after the consolidation of the adjacent tubes, for the fascicles are not disarranged. If the peristomes are scattered the peristomies are long and never adjacent. It is probable that fossilization caused the long non-adjacent peristomies to disappear from the species, of which the bases alone are visible.

Affinities.—This species differs from *Mesenteripora meandrina* Robertson, 1910, in the ovicell not placed near the zoarial margin, and in its tubes grouped in fascicles.

In spite of exterior appearances the tubes are not arranged as in *Reticulipora*, the axis of the apertura being placed in the longitudinal axis of the zooecia.

Occurrence.—Pleistocene: Santa Barbara (common), and Santa Monica (Rustic Canyon), California (rare).

Cotypes.—Cat. Nos. 68747, 68748, U.S.N.M.

Genus DIAPEROECIA Canu, 1918.

(For description, see Bulletin 106, U. S. National Museum, p. 740.)

DIAPEROECIA FLABELLATA, new species.

Plate 43, figs. 18, 19.

Description.—The zoarium is free, bilamellar and formed of *flabellate* fronds, and irregularly twisted. The tubes are little visible, widened at their extremity; the peristome is thin, salient, elliptical, horizontal. The ovicell is convex, smooth, traversed by 6–10 tubes; the oeciostome is crescentric and joined to an ordinary peristome.

Measurements.—

Diameter of the peristome	0. 15 mm.
Distance between the peristomes	0. 42–0. 50 mm.
Separation of the peristomes	0. 50–0. 55 mm.

Occurrence.—Pleistocene: Santa Monica (Tremochal Canyon) (rare), and Dead Mans Island, off San Pedro, California (very rare).

Holotype.—Cat. No. 68749, U.S.N.M.

DIAPEROECIA MILNEANA D'Orbigny, 1839.

Plate 6, figs. 20, 21.

1839. *Idmonea milneana* D'Orbigny, Voyage dans L'Amérique Méridionale, vol. 5, pt. 4, p. 20, pl. 9, figs. 17–21.

1919. *Idmonea milneana* Canu and Bassler, Geology and Paleontology of the West Indies, Bryozoa, Publications of the Carnegie Institution of Washington, No. 291, p. 99, pl. 6, figs. 20, 21.

1920. *Idmonea milneana* Canu and Bassler, North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 773, pl. 136, figs. 1–12.

This recent species has been identified in a number of Tertiary formations of Europe and in the Jacksonian and Vicksburgian of North America. So far the only discovery of it in the post-Oligocene strata of North America is in the Lower Miocene of Santo Domingo, where the single specimen here illustrated has been found.

The discovery of numerous ovicelled specimens of this species in dredgings from the Gulf of Mexico cause us to refer it generically as above.

Occurrence.—Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo (rare).

Plesiotype.—Cat. No. 68750, U.S.N.M.

Family LICHENOPORIDAE Smitt, 1866.

Genus LICHENOPORA Defrance, 1823.

(For description, see Bulletin 106, U. S. National Museum. p. 812.)

LICHENOPORA CALIFORNICA Conrad, 1855.

Plate 44, figs. 4–7.

?1852. *Unicavea californica* D'ORBIGNY, Paleontologie francaise, Terrains crétacés, vol. 5, Bryozoaires, p. 972.

1855. *Lichenopora californica* CONRAD, Note on Miocene and Postpliocene deposits of California, Proceedings Academy Natural Sciences Philadelphia, vol. 7, p. 441.

1910. *Lichenopora californica* ROBERTSON, Cyclostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 6, p. 261, pl. 25, figs. 48, 49 (bibliography).

Historical.—*Unicavea californica* is thus defined by D'Orbigny, 1852: "Espèce très convexe endessus, ayant le centre excavé, et pourvue de pores intermédiaires énormes. Madelaine, Basse Californie." Its classification in the genus *Unicavea* indicates moreover that the colony is discoidal, creeping, incrusting, provided with a single series of cellules in the rows.

Waters, 1905,[8] examined D'Orbigny's type preserved in the Museum of Paris. He notes: "The zooecia are uniserial, slightly raised; zooecia and cancelli about the same size. This does not seem to be the *Discoporella californica* of Busk."

What Conrad, Gabb and Horn, Busk, and Robertson have named *Lichenopora californica* does not appear therefore to be the species of D'Orbigny, as the zoarium is free and the fascicles are biserial. Under these conditions we believe it necessary to substitute the name of Conrad, 1855, for that of D'Orbigny. It is useless to change the specific name, as the specimen of D'Orbigny has not been figured.

Structure.—The structure of this species is quite constant. The zoarium is free and very convex. The fascicles are regular and biserial. The cancelli are very large and often wider than the tubes. The ovicell is placed in the center of the zoarium and hidden by the cancelli. The oeciostome is large, orbicular, salient, placed excentrically in the vicinity of the fascicles.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Plesiotypes.—Cat. No. 68751, U.S.N.M.

LICHENOPORA HISPIDA Fleming, 1828.

Plate 41, figs. 1–3.

1828. *Discopora hispida* FLEMING, History of British Animals, p. 530.

1884. *Lichenopora hispida* HINCKS, Polyzoa of Queen Charlotte Islands, Annals and Magazine Natural History, ser. 5, vol. 13, p. 207.

1889. *Lichenopora hispida* JELLY, A synonymic catalogue of marine Bryozoa, p. 134 (general bibliography).

1901. *Lichenopora hispida* WHITEAVES, Catalogue of the marine invertebrates of eastern Canada, Geological Survey of Canada, p. 112.

1905. *Lichenopora hispida* NEVIANI, Briozoi fossili de Carrubare, Calabria, Bollettino della Societa geologica italiana, vol. 23, p. 554 (52).

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[8] Notes on some Recent Bryozoa in D'Orbigny's collection, Annals and Magazine of Natural History, ser. 7, vol. 15, p. 15.

1907. *Lichenopora hispida* Calvet, Expéditions scientifiques du *Travailleur* et du *Talisman*, Bryozoaires, p. 466 (complementary bibliography).

1907. *Lichenopora hispida* Nordgaard, Bryozoen von dem norwegischen-Fischereidampfer "Michael Sars," Bergens Museum Aarbog, p. 17.

1908. *Lichenopora hispida* Canu, Les Bryozoaires du Sud-Ouest de la France, Bulletin societe geologique France, ser. 4, vol. 8, p. 388, pl. 7, fig. 18.

1912. *Lichenopora hispida* Guérin-Ganivet, Contributions a l'etude des Bryozoaires des côtes armoricaines, III, Bryozoaires de la région de Concarneau et de l'Archipel de Glenan, Travaux scientifiques du Laboratorie de Zoologie de Concarneau, vol. 4, p. 21.

1912. *Lichenopora hispida* Barroso, Briozoos de la Estaceon de Zoologia maritima de Santander, Trabajos del Museo de ciencias naturales, no. 5, p. 59.

1913. *Lichenopora hispida* Guérin-Ganivet, Bryozoaires de la mission arctique du "Jacques Cartier," Société d'oceanographie du Golfe de Gascogne, fasc. 7, p. 42.

1916. *Lichenopora hispida* F. Canu, Bryozoaires fossiles des Terrains du Sud-Ouest de la France, Bulletin Société géologique de France, ser. 4, vol. 15, p. 333.

1918. *Lichenopora hispida* Nordgaard, Bryozoa from the Arctic regions, Tromso Museums Aarschefter, vol. 40 (1917), no. 1, p. 21.

Variations.—This species appears to us as poorly defined. Generally authors have classed under this name all specimens in which the fascicles do not reach the zoarial margin, which is therefore garnished with tubes in quincunx. But the ovicells on these various specimens are not exactly similar. The fossils have lost their visor, which renders their determination still more difficult and less certain.

All the fossil species of *Lichenopora* resemble each other, and our determination is perhaps not good because in addition only the two figured specimens have been found and we have been unable to make any useful sections.

The ovicell does not bear cancelli in Fleming's species; and we have not observed the oeciostome.

Occurrence.—Pleistocene: Santa Barbara, California (rare).

Geological distribution.—Aquitanian of France (Canu); Helvetian of Italy (Seguenza), of France (Canu collection), Tortonian of Austria Hungary (Reuss); Zanclean of Italy (Seguenza); Plaisancian of England (Busk), of Italy (Manzoni); Astian of Italy (Seguenza); Sicilian of Italy (Seguenza, Neviani); Quaternary of Italy (Seguenza, Neviani).

Habitat.—Arctic Ocean: Greenland, Scandinavia (20–420 meters), White Sea, Finmark. Eastern Atlantic: North Sea, England, English Channel (240–300 meters), Gulf of Gascony. Western Atlantic: Canada. Mediterranean: At Cette (15–90 meters), Corse (40–60 meters), Marseilles, Naples, Oran (75 meters). Pacific: Australia, New Zealand, Queen Charlotte Islands.

In the great depths of the Arctic regions (420 meters) the temperature observed, according to Nordgaard, has been +5° C.

Plesiotype.—Cat. No. 68752, U.S.N.M.

LICHENOPORA RADIATA Savigny-Audouin, 1826.

Plate 44, fig. 10.

1826. *Melobesia radiata* Audouin, Explication sommaires de planches de polypes de Savigny Description de l'Égypte, vol. 1, p. 235, pl. 6, fig. 3.

1889. *Lichenopora radiata* Jelly, A synonymic catalogue of marine Byrozoa, p. 137 (general bibliography).

1905. *Lichenopora radiata* Neviani, Briozoi fossili di Carrubare (Calabria), Bollettino della Società geologica italiana, vol. 23, p. 554.
1910. *Lichenopora radiata* Waters, Reports on the marine biology of the Sudanese Red sea, The Bryozoa, Journal Linnean Society, London, vol. 31, p. 237 (complementary bibliography).
1910. *Lichenopora radiata* Robertson, Cyclostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 6, p. 262, pl. 24, figs. 46, 47.
1912. *Lichenopora radiata* Barroso, Bryozoos de la estación biológica marítima de Santander. Trabajos del Museo de ciencias naturales, no. 5, p. 60.
1915. *Lichenopora radiata* Barroso, Contribución al conocimiento de los Briozoos marinos de España, Boletín de la real sociedad española de Historia natural, vol. 15, p. 419.

Our specimens agree exactly with the typical form of this widespread recent species. According to Waters, there are nine tentacles.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (rare).

Geological distribution.—Miocene of Australia and New Zealand (Waters). Zanclean of Italy (Seguenza); Astian of Italy (Neviani); Sicilian of Italy (Neviani, Seguenza), of Rhodes (Pergens); Quaternary of Italy (Neviani, Waters, Seguenza).

Habitat.—Atlantic: British Channel, Gulf of Gascony (135 meters), Madeira. Mediterranean: Corse, Naples, Adriatic (32–89 meters), Majorca. Pacific: Australia, Japan, and California.

Plesiotype.—Cat. No. 68753, U.S.N.M.

LICHENOPORA VERRUCARIA Fabricius, 1780.

Plate 44, figs. 8, 9.

1899. *Lichenopora verrucaria* Jelly, A synonymic catalogue of marine Bryozoa, p. 138 (bibliography).
1900. *Lichenopora verrucaria* Robertson, Bryozoa, Harriman Alaskan Expedition, Proceedings Washington Academy Sciences, vol. 2, p. 329.
1900. *Lichenopora verrucaria* Nordgaard, Polyzoa, Norske Nordhavs Expedition, Zoology, no. 27 vol. 27, p. 20.
1901. *Lichenopora verrucaria* Whiteaves, Catalogue of the marine Invertebrata, Canadian Geological Survey, p. 113.
1905. *Lichenopora verrucaria* Nordgaard, Hydrographical and biological investigations in Norwegian fiords, Bergen Museum, p. 173.
1906. *Lichenopora verrucaria* Nordgaard, Bryozoa from the Second Fram Expedition, The Society of Arts and Sciences of Kristiania, no. 8, p. 37.
1910. *Lichenopora verrucaria* Robertson, Cyclostomatous Bryozoa of the west coast of North America, University of California Publications, Zoology, vol. 6, p. 263, pl. 25, fig. 50.
1912. *Lichenopora verrucaria* Osburn, Bryozoa of the Woods Hole region, Bulletin Bureau of Fisheries, vol. 30, p. 219, pl. 18, fig. 13.
1912. *Lichenopora verrucaria* Nordgaard, Duc d'Orléans, Campagne arctique de 1907, p. 25.
1912. *Lichenopora verrucaria* Guérin-Ganivet, Contributions à l'étude des Bryozoaires des côtes armoricaines, III, Bryozoaires de la région de Concarneau et de l'Archipel de Glenan, Travaux scientifiques du laboratoire de Zoologie de Concarneau, vol. 4, p. 22.
1918. *Lichenopora verrucaria* Nordgaard, Bryozoa from the Arctic region, Tromso Museums Aarschefter, vol. 40, (1917), p. 21.

Variations.—The oeciostome of our ovicelled specimen was well preserved in form, very large, salient, and auricular. Unfortunately it was broken in cleaning the specimen. It was larger than the oeciostomes figured by Smitt and by Miss Robertson, and it corresponded more to Osburn's figure.

This is a polar species, as it does not pass beyond the fortieth parallel in the Atlantic and the thirtieth parallel in the Pacific. This is the first time that it has been found fossil.

Occurrence.—Pleistocene: Santa Monica (Rustic Canyon), California (very rare).

Habitat.—Arctic Ocean: Finmark, Spitzberg, Kara Sea (166–216 meters), Greenland, Jean Mayen (160–180 meters), Sea of Barents, Iceland (162 meters). Atlantic: Scandinavia (6–24 meters), Denmark (13–18 meters), England, Labrador (24 meters), Canadian coast (11–97 meters), United States to the fortieth parallel. Pacific: Alaska and California.

Verrill has observed this species at 56 meters with a temperature of 6.1° C.

Plesiotype.—Cat. No. 68754, U.S.N.M.

Family TRETOCYCLOECIIDAE Canu, 1918.

Genus TRETOCYCLOECIA Canu, 1919.

(For description, see Bulletin 106, U. S. National Museum, p. 826.)

TRETOCYCLOECIA TORTILIS Lonsdale, 1845.

Plate 28, figs. 1–12.

1845. *Heteropora tortilis* Lonsdale, Report on the Corals from the Tertiary formation of North America, Quarterly Journal Geological Society London, vol. 1, p. 500, text figure.

1857. *Heteropora tortilis* Tuomey and Holmes, Pleiocene Fossils from South Carolina, p. 16, pl. 4, figs. 15, 16.

1862. *Multicrescis tortilis* Gabb and Horn, Monograph Polyzoa Secondary and Tertiary formations North America, Journal Academy Natural Science Philadelphia, ser. 2, vol. 5, p. 178.

Structure.—The zoarium is rarely globular but is almost always irregularly cylindrical, branched, attached to the radicells of algae. The ovicell is suborbicular and regularly perforated by the tubes. It is rather deep and of variable dimensions. At the exterior surface the walls of the tubes are thin or thick. The mesopores are rare on certain branches, abundant in groups on others. This irregularity must correspond to conditions of equilibrium which we still do not comprehend very well.

In longitudinal sections the tubes are cylindrical, bifurcating at all heights; their walls are vesicular. The mesopores are irregularly distributed between the orifices.

In transverse sections the tubes are polygonal at the center of the zoarium. The mesopores are always rather short.

In tangential sections the zooecial walls are thick. The interior walls are strongly calcified and appear as thin black lines separated by large clearer spaces corresponding to a less dense calcification.

This is one of the most showy species of the American Miocene.

Occurrence.—Miocene: Yorktown, Williamsburg, and 3 miles southwest of Petersburg, Virginia (common); Smith's Goose Creek, South Carolina.

Plesiotypes.—Cat. No. 68755, U.S.N.M.

TRETOCYCLOECIA AVELLANA, new species.

Plate 27, figs, 5–11.

Description.—The zoarium is free, spherical, born on a flat surface, and of the size of a *hazel nut*, simple or lobed. The tubes are cylindrical, branched at all heights, separated by a thick continuous cuticle; the orifice is polygonal with salient peristome. The ovicell is large, irregular, surrounding a score of tubes.

Variations.—The form of the zoarium is quite variable, but it is always a small globular mass simple or mammillated. It grows either on shells or on algae. The small pores observed on the surface of the zoarium are not mesopores but are young tubes in process of formation. The diameter of the normal apertures varies from 0.12 to 0.15 mm.

In longitudinal section the zooecial walls are not vesicular; they show a long, minute canal corresponding to the disappearance of the cuticle which surrounded the tubes on a living specimen.

Affinities.—This species differs from *Tretocycloecia tortilis* Lonsdale, 1845, in its nonarborescent zoarial form, in the smaller zooecial diameter, and in its larger ovicell.

Occurrence.—Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina (very rare). Miocene (Duplin marl): One-half mile above Edenhouse Point, Chowan River, and 10 miles south of Greenville, North Carolina (rare).

Cotypes.—Cat. Nos. 68756–68757, U.S.N.M.

Genus PSILOSOLEN Canu and Bassler, 1922.

1922. *Psilosolen* Canu and Bassler, Studies on Cyclostomatous Bryozoa, Proc. U. S. National Museum, vol. 61, p. 112.

There are no adventitious tubes. The tubes are cylindrical with peripheral gemmation.

Genotype.—*Psilosolen capitiferax,* new species.

Range.—Pleistocene, Recent.

The ovicell is a swelling perforated by the tubes as in the Diaperoeciidae, but it is not inserted in the tubes themselves. On the contrary, the ovicell is perpendicular to the tubes and surrounds only the peristomes as in the family Tretocycloeciidae, where this new genus may be naturally classed. The ovicell is little convex and very different from the elongated and very salient sac of the Ascosoeciidae.

It is remarkable to note again that through the geological ages it is the simplest form of the family that has persisted. The Cretaceous and Tertiary genera of this family are provided with adventitious tubes.

PSILOSOLEN CAPITIFERAX, Canu and Bassler, 1922.

Plate 44, figs. 11–21.

1922. *Psilosolen capitiferax* Canu and Bassler, Studies on Cyclostomatous Bryozoa, Proc. U. S. National Museum, vol. 61, p. 112, pl. 13, fig. 8.

Description.—The zoarium is free, with the form of *Entalophora,* more or less compressed, dichotomous; the extremity of the branches is enlarged, flattened, and *bears the ovicell.* The tubes are visible, separated by a furrow, convex, wrinkled transversely, somewhat widened at the summit; the peristome is thin, salient, elliptical or suborbicular. The ovicell is a swelling covering the extremity of a branch; it is perforated by a dozen tubes, some of which are closed by a finely porous diaphragm.

Measurements.—

Diameter of the peristome	0.16–0.18 mm.
Diameter of the orifice	0.12 mm.
Distance between the peristomes	0.50–1.35 mm.
Separation of the peristomes	Variable.
Diameter of a tube	0.18–0.20 mm.

Structure.—We have made longitudinal and meridianal sections of a number of examples, all of which show the same structure. The zoarial form is a simple compression without any relationship to the structure of the species. In longitudinal section the tubes are cylindrical with peripheral gemmation, reproducing at all heights. The exterior walls of the zoarium are thick.

The transverse section is elliptical in consequence of the compression of the zoarium. The tubes here are of equal size as characteristic of cylindrical tubes. The very small tubes scattered among the large ones are the tubes newly formed by peripheral gemmation which have not reached their normal diameter.

Variations.—The peristomes are not regularly placed on the zoarium: they are grouped in irregular zones as in *Peripora.* They are little salient, but the irregularity of the dimensions indicates the peristome was prolonged by a very long peristomie broken by fossilization.

The tube measures its greatest width in the portion where it bends away from the zoarium. The tubes which appear exteriorly to arise from an immediately inferior tube are the shorter. Those which appear to arise from before the last row and which slip between the proximal peristomes are the longer.

The ovicell located at the end of the branch is not very salient. It is hollowed out of the zoarium itself, as is easy to verify in the sections.

Affinities.—Our species is almost identical with *Entalophora capitata* Robertson, of whose variations we are ignorant. It differs from it in its ovicell, which completely covers the end of the branch, and in the smaller micrometric dimensions (if the enlargement indicated on Miss Robertson's figures is exact).

Occurrence.—Pleistocene: Santa Barbara (very common), and Dead Mans Island, off San Pedro, California (rare).

Cotypes.— Cat. No. 68758, U.S.N.M.

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APPENDIX.

TREMOGASTERINA TRUNCATOROSTRIS, new species.

Plate 47, Fig. 6.

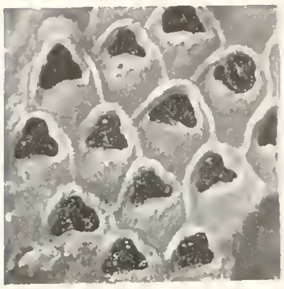
Description.—The zoarium is bilamellar. The zooecia are distinct, separated by a furrow, elongated, elliptical; the frontal is perforated by a trifoliate orifice resulting from the coalescence of three large pores arranged in a triangle: a large salient rounded mucro is present and is prolonged somewhat above the aperture. The aperture is large, semicircular. On each side there are two large, straight avicularia, with pivot, the beak of which is *truncated* and forms a transverse straight line. The ovicell is large salient globular, finely granular.

Measurements.—Apertura $\left\{\begin{array}{l} ha = 0.17\text{–}0.20 \text{ mm.} \\ la = 0.17\text{–}0.20 \text{ mm.} \end{array}\right.$ Zooecia $\left\{\begin{array}{l} Lz = 0.60 \text{ mm.} \\ lz = 0.35\text{–}0.40 \text{ mm.} \end{array}\right.$

Affinities.—This new species differs from *Tremogasterina horrida*, new species, and *T. problematica* Canu, 1911, in its trifoliate frontal pore arising manifestly from the coalescence of three pores. It approaches in its ovicell *Escharipora? mucronata* Smitt, 1872, but differs from it in its large truncated avicularia and in its frontal pores united together. It is indeed an intermediate species between the forms with a large single frontal pore and those with three pores in a triangle. It is also probable that Smitt's species is also a *Tremogasterina*. If the studies on the living species prove this to be correct, Smitt's species could then be considered the type of this American genus whose structure has always remained mysterious.

Occurrence.—Miocene (Bowden horizon): Santo Domingo (very rare).

Holotype.—Cat. No. 68685, U.S.N.M.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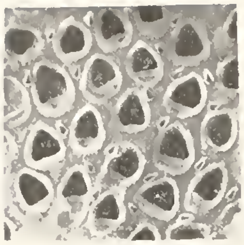
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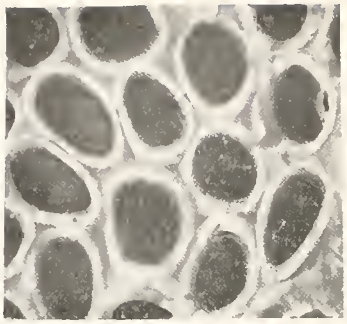
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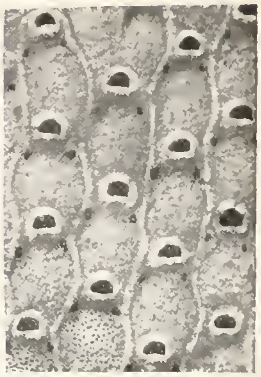
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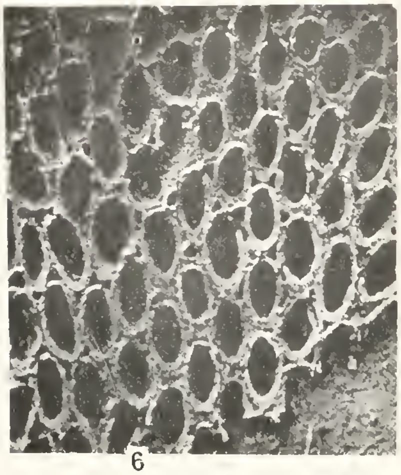
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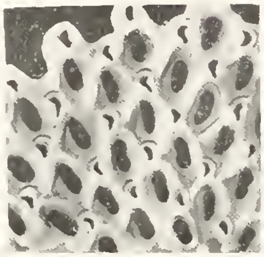
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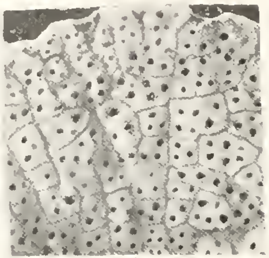
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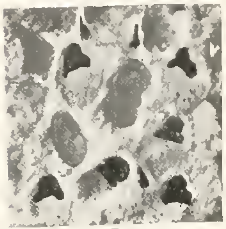
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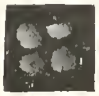
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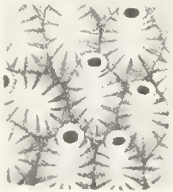
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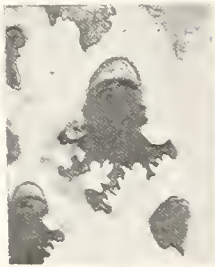
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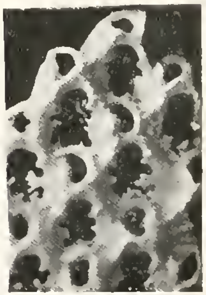
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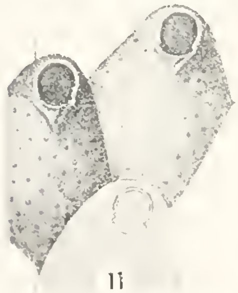
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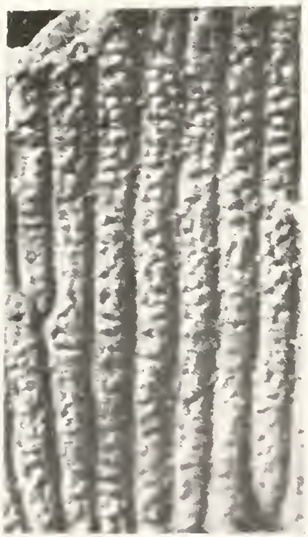
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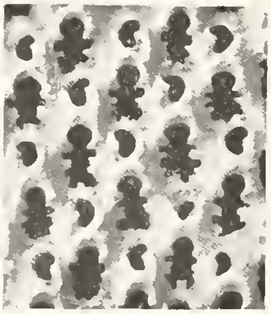
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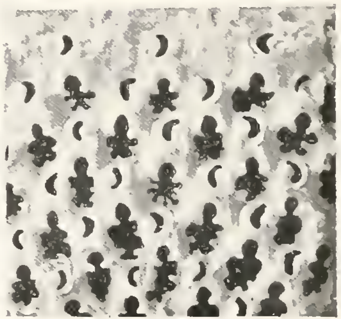
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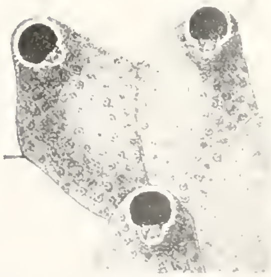
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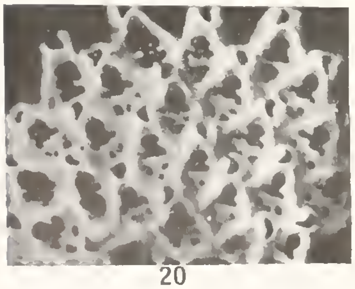
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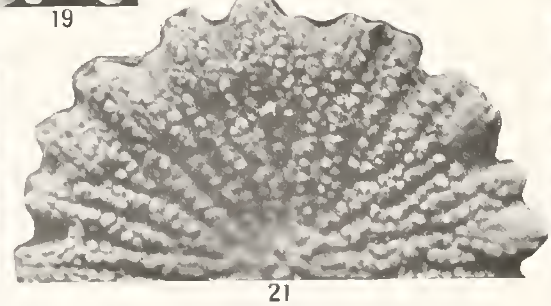
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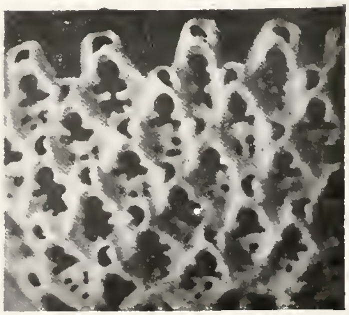
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 245.

Plate I.

Fig. 1. *Floridina pyripora* Canu and Bassler, 1919. (p. 56.)

Surface of the incrusting zoarium, × 20, showing the large poorly defined opesiules, the pyriform opesium and the smooth salient endozooecial ovicell.

Oligocene (Antigua formation): Rifle Butts, Antigua, Leeward Islands.

Fig. 2. *Callopora dumerilii* Savigny-Audouin, 1826. (See also pl. 2, fig. 23; pl. 12, fig. 12.) (p. 40.)

Portion of the specimen, × 20, separated by Canu and Bassler in 1919 as var. *lata*.

Oligocene (Anguilla formation): Southwest side Crocus Bay Bluff, Anguilla, Leeward Islands.

Fig. 3. *Ogivalina mutabilis* Canu and Bassler, 1919. (p. 37.)

The incrusting type specimen, × 20, illustrating the large, irregular opesia, small endozooecial ovicell, the small gymnocyst and the supposed avicularium.

Oligocene (Emperador limestone): Near Empire, Panama Canal Zone.

Fig. 4. *Calpensia impressa* Moll, 1803. (p. 83.)

Surface of the incrusting zoarium, × 20, referred to this species.

Oligocene (Antigua formation): Carlisle marl pit, Antigua, Leeward Islands.

Fig. 5. *Floridina fusifera* Canu and Bassler, 1919. (p. 56.)

The incrusting type specimen, × 20, exhibiting the small opesium, large, rounded opesiules, prominent polypidian convexity, large onychocellarium and small fusiform avicularia.

Oligocene (Antigua formation): Rifle Butts, Antigua, Leeward Islands.

Fig. 6. *Conopeum lacroixii* Busk, 1852. (p. 26.)

Portion of the incrusting zoarium, × 20, showing the characteristic interopesial cavities and small tuberosities on the mural rim.

Miocene (Bowden marl): Bowden, Jamaica.

Figs. 7–9. *Cupuladria canariensis* Busk, 1859. (p. 28.)

7. Two of the small, free, conical zoaria, natural size.

8. The celluliferous, convex surface, × 20, illustrating the membraniporoid opesium and the vibracula.

9. Concave, basal surface, × 20, showing the characteristic polygonal areas marked by pores.

Miocene (Gatun formation): Banana River, Costa Rica.

Fig. 10. *Puellina radiata carolinensis* Gabb and Horn, 1862. (p. 90.)

Gabb and Horn's illustration of this variety.

Eocene (Jacksonian) of South Carolina.

Fig. 11. *Hippoporina lata* Smitt, 1872. (p. 131.)

View of several zooecia, much enlarged (after Smitt).

Recent: Gulf of Mexico.

Fig. 12. *Porella bella* Busk, 1860. (p. 147.)

Smitt's illustration of *Escharella landsborovi*.

Recent: Gulf of Mexico.

Figs. 13–17. *Cupularia haidingeri* Reuss, 1847. (p. 77.)

13. The small discoidal zoaria, natural size.

14. The inner side, × 20, showing the tuberose, bifurcating ribs.

15, 16. Portions of the celluliferous side, × 25, illustrating the two symmetrical condyles and the denticular processes.

17. A zooecium, × 50, showing the structure of the spinose processes which are flat, claviform, and finely denticulated.

Redonnian: Pigeon Blanc, France.

Fig. 18. *Cupularia doma* D'Orbigny, 1852. (See also pl. 15, figs. 1–5.) (p. 77.)

Zooecia, × 25, showing the two symmetrical spinules forming condyles and three irregular ununited spinules.

Mediterranean: Oran, Algeria.

Figs. 19–22. *Cupularia reussiana* Manzoni, 1869. (p. 78.)

19. Several, small cupuliform zoaria, natural size.

20. Zooecia, × 25, showing the trifoliate opesium and that the condyles are not united to the spinules.

21. Inner side, × 20, illustrating the large tuberosities.

22. View of zooecia, × 25, in which some of the spinules are not united together.

Sicilian: Farnesina, Italy.

Plate 2.

Fig. 1. *Membranipora vaughani* Canu and Bassler, 1919. (p. 23.)

The incrusting zoarium, × 20, showing the large rounded interzooecial tubercles.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Figs. 2, 3. *Acanthodesia savarti* forma *monilifera* Canu and Bassler, 1919. (p. 32.)

The hollow cylindrical zoarium, natural size and × 20. The beaded structure of the mural rim is apparent.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Fig. 4. *Hemiseptella lata* Canu and Bassler, 1919. (p. 70.)

Part of the incrusting type specimen, × 20, with some zooecia showing the characteristic inferior denticle.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Figs. 5–7. *Nellia oculata* Busk, 1852. (p. 55.)

5. Normal zooecia with tubercles, complete, × 25.

6. Fragment showing large zooecia, × 25; the tubercles are replaced by pores.

7. View of fragment, × 25, showing two sides of the zoarium.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Figs. 8–10. *Corynostylus ellipticus* Canu and Bassler, 1919. (p. 84.)

8. Several fragments of the articulated zoarium, natural size.

9. Anterior face of zoarium, × 25, showing the characteristic unilamellar growth with two rows of zooecia.

10. Posterior face, × 25.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Figs. 11–13. *Corynostylus labiatus* Canu and Bassler, 1919. (p. 84.)

11. Complete segment of the articulated bilamellar zoarium, natural size.

12. Photograph of the same, × 25. The salient opesial lip is shown.

13. Section, × 20, exhibiting the interior of the zooecia in the middle row and a longitudinal section in the outer rows.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Fig. 14. *Thalamoporella granulata* Levinsen, 1909. (p. 61.)

Small fragment, × 20, identified with this recent species.

Lower Miocene (Bowden horizon): Rio Gurabo, Santo Domingo.

Figs. 15–19. *Cupularia umbellata* Defrance, 1823. (p. 80.)

15. The discoid zoaria, natural size.

16. Photograph of the inner tuberose side, × 25.

17. Ancestrular region, × 25, in which the ancestrula is covered over by a normal zooecium.

18. Ancestrular region of another zoarium, × 25; the zooecia are arranged alternately and in inverted order.

19. Another view of the ancestrular region, × 25; here the ancestrula is a membraniporoid zooecium.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Figs. 20, 21. *Smittina? brevis* Canu and Bassler, 1919. (p. 146.)

20. Surface of the bilamellar zoarium, × 20.

21. Ovicelled zooecia of another fragment, × 20.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Fig. 22. *Rhynchozoon vaughani* Canu and Bassler, 1919. (See also pl. 4, figs. 1, 2.) (p. 155.)

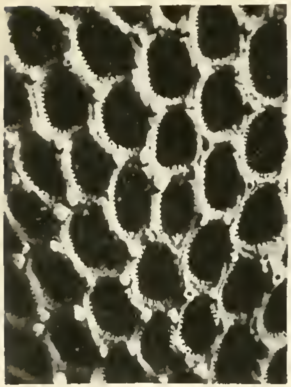
A small fragment, × 20.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

Fig. 23. *Callopora dumerilii* Savigny-Audouin, 1826 (see also pl. 1, fig. 2; pl. 12, fig. 12.) (p. 40.)

An example, × 20 showing thick mural rims and regenerated zooecia.

Lower Miocene (Bowden marl): Bowden, Jamaica.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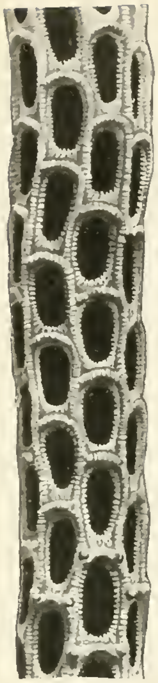
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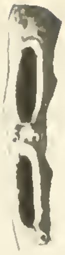
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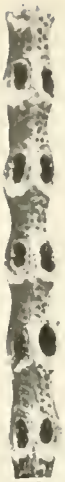
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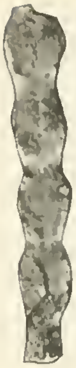
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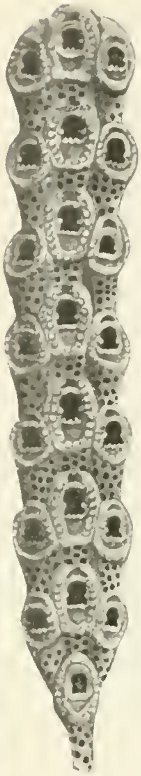
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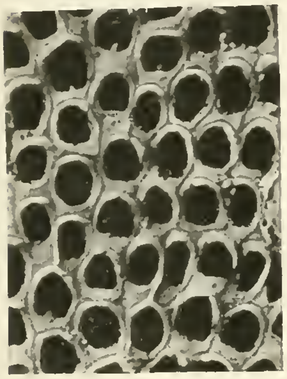
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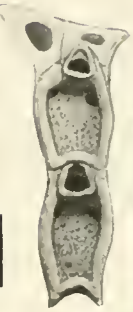
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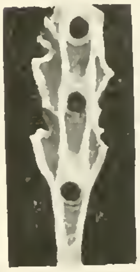
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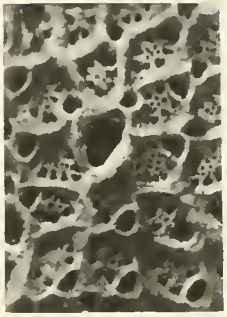
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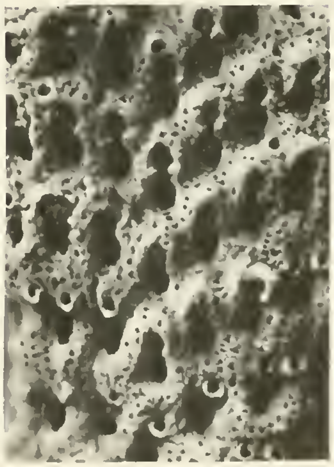
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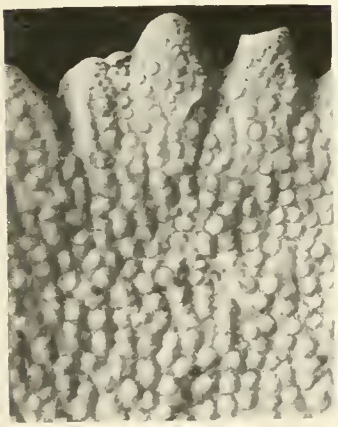
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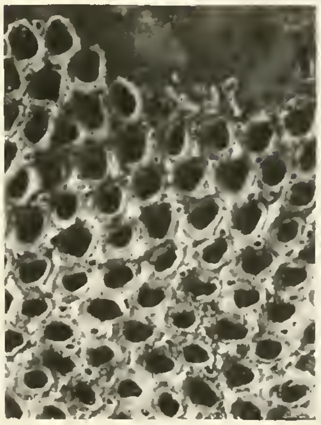
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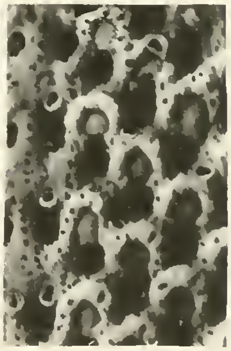
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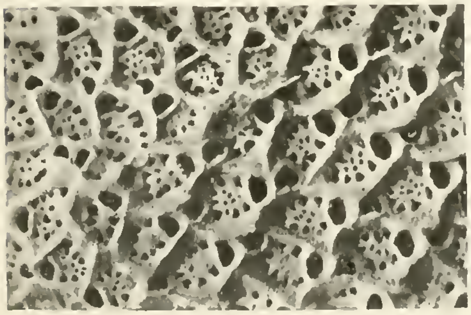
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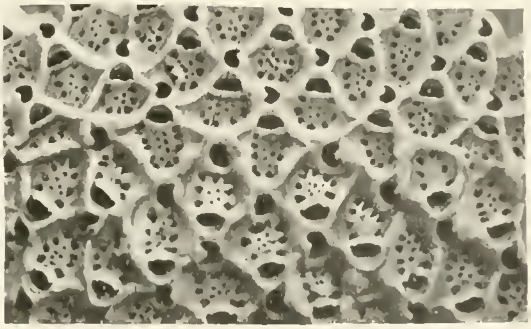
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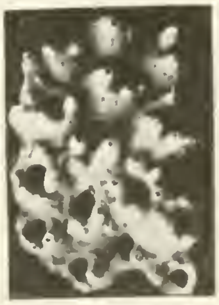
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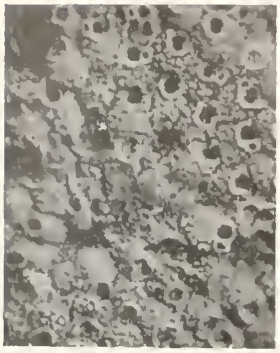
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 246.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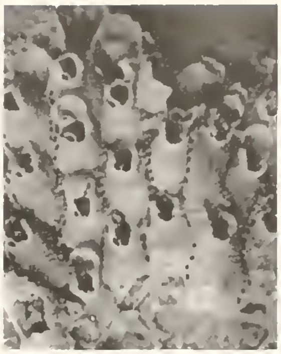
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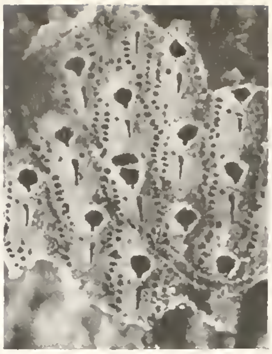
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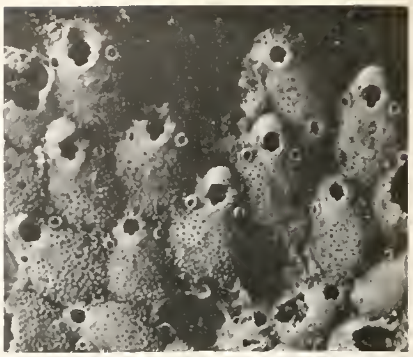
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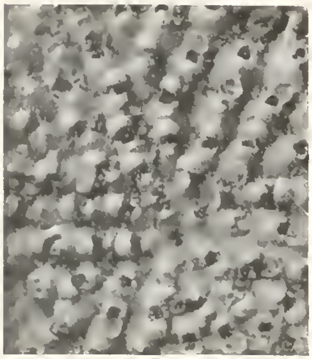
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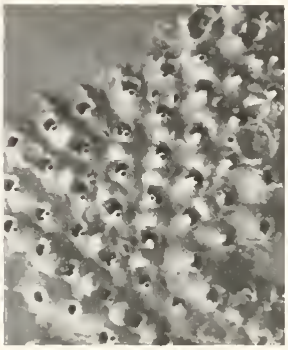
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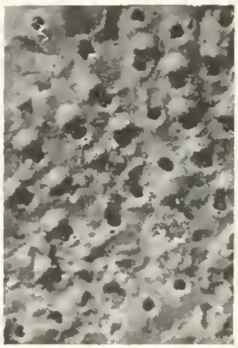
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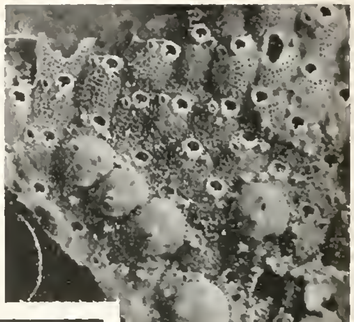
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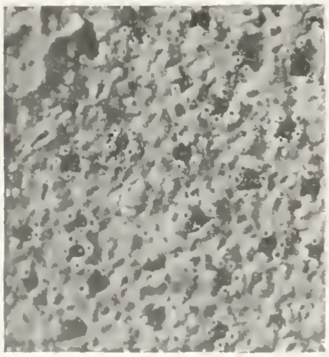
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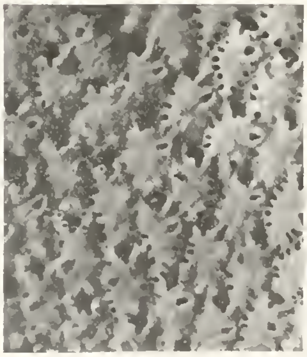
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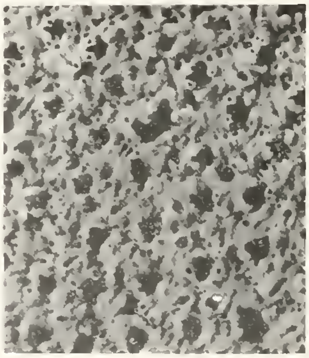
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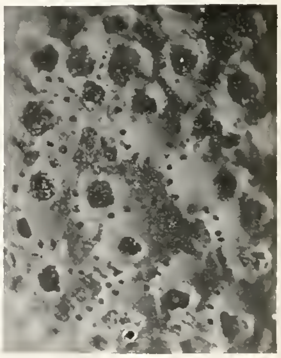
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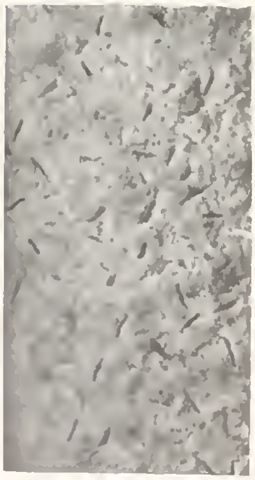
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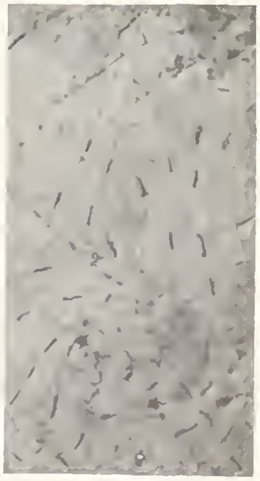
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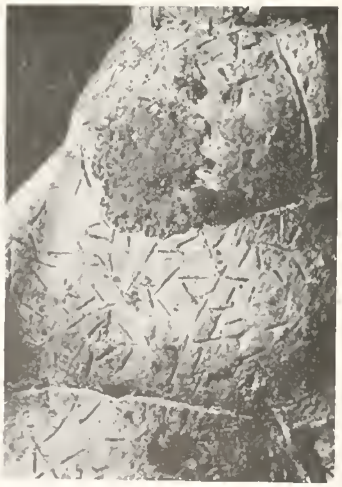
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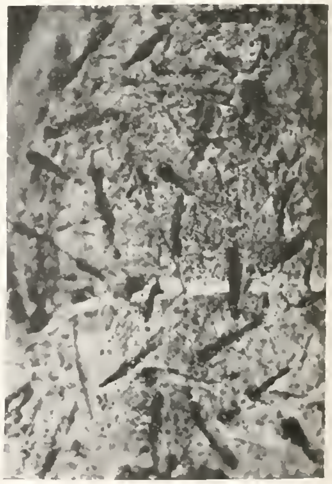
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NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 247.

PLATE 3.

FIG. 1. *Hippodiplosia baccata* Canu and Bassler, 1920. (p. 131.)

View, × 20, of Miocene example of this species.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIG. 2. *Rhamphostomella granulosa*, new species. (p. 151.)

The incrusting zoarium, × 20, showing the granular pleurocyst, small areolar pores, and the aperture with its triangular avicularium.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIG. 3. *Smittina ophidiana* Waters, 1877. (p. 144.)

A small incrusting zoarium, × 20. The large median avicularium, two frontal pores, rectangular lateral pores, and granular ovicell are to be noted.

Miocene (Bowden marl): Bowden, Jamaica.

FIG. 4. *Mastigophora granulosa*, new species. (p. 172.)

Ovicelled and unovicelled zooecia of the incrusting zoarium, × 20, illustrating their large size, granular surface, and the position of the vibracula at the level of the rimule.

Lower Miocene (Bowden marl): Bowden, Jamaica,

FIGS. 5–7. *Aimulosia brevis*, new species. (p. 140.)

5. The incrusting zoarium, × 20, illustrating the zooecia in the ancestrular region.

Lower Miocene (Bowden marl): Bowden, Jamaica.

6. A typical example, × 20, with the usual short zooecia bearing very salient median avicularia.

7. Marginal portion of a zoarium, × 20, exhibiting larger zooecia.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.

FIG. 8. *Stylopoma minuta*, new species. (p. 104.)

Portion of the incrusting type specimen, × 20. The ovicell entirely covering the apertura and the small size of the zooecia are to be noted.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIGS. 9, 10. *Holoporella hemispherica*, new species. (p. 176).

9. Several of the small, free, hemispherical zoaria, natural size.

10. Zooecia, × 20, illustrating their large size and convex frontal, surrounded by large areolar pores.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIGS. 11–13. *Rhynchozoon verruculatum* Smitt, 1872. (p. 157.)

11. Central portion of the incrusting zoarium, × 20, showing indistinct zooecia.

12. Marginal zooecia, ×20, with outlines well preserved.

13. Another aspect of the zooecial surface, × 20.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.

FIGS. 14, 15. *Terebripora sinefilum*, new species. (p. 15.)

14. A normal zoarium, × 20, illustrating deeply perforated old zooecia and absence of canals.

15. Portion of a young zoarium, × 10, showing both the axes and the zooecia. The latter have not perforated the shell very deeply.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIGS. 16, 17. *Terebripora elongata*, new species. (p. 15.)

16. The type specimen, × 3 and a small portion, × 10, illustrating the very large size and elongate shape of the zooecia.

Lower Miocene (Bowden marl): Bowden, Jamaica.

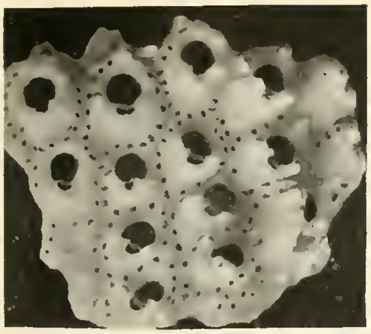
PLATE 4.

FIGS. 1, 2. *Rhynchozoon vaughani* Canu and Bassler, 1919. (See also pl. 2, fig. 22.) (p. 155.)
   1. The unilamellar zoarium, × 20, showing young condition in which the zooecia are distinct.
   2. Old condition of zoarium, × 20. The zooecia are indistinct and not oriented.
   Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

FIGS. 3–12. *Metrarabdotos colligatum* Canu and Bassler, 1919. (p. 162.)
   3–5. Different aspects of the base of the zoarium, × 6.
   6. Three fragments, natural size, preserving base.
   7. Portion of zoarial surface, × 20, with ovicells well preserved.
   8. Base of a zoarium, × 20, showing calcification and disappearance of the apertures.
   9. Broad zooecia, × 20, characteristic of the aged condition.
   10. Narrow zooecia, × 20, of youthful condition.
   11. Normal zooecia, × 20.
   12. Longitudinal section, × 20, exhibiting the interior of the zooecia.
   Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

FIG. 13. *Palmicellaria* cf. *inermis* Jullien, 1882. (p. 149.)
   The branching fragment referred doubtfully to this species, × 20.
   Lower Miocene (Bowden horizon): Santo Domingo.

FIG. 14. *Rhynchozoon curtum*, new species. (p. 156.)
   The unilamellar zoarium, × 20, illustrating the characteristic short zooecia.
   Lower Miocene (Bowden horizon): Santo Domingo.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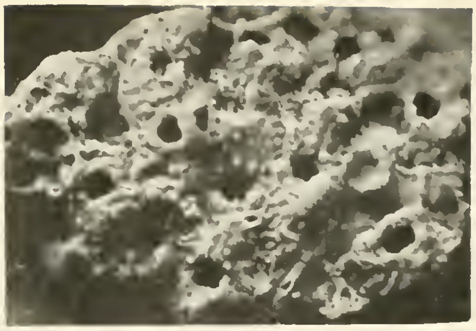
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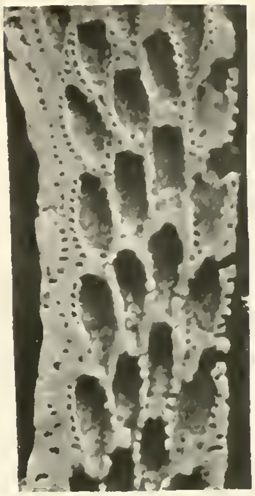
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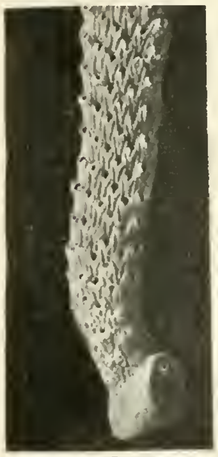
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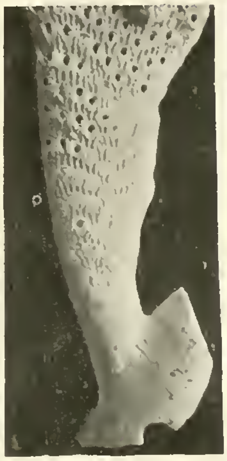
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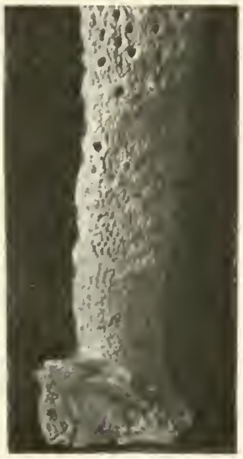
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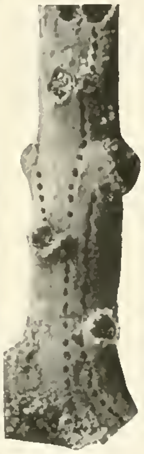
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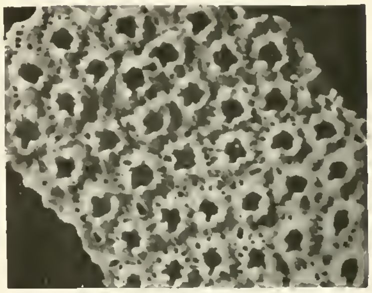
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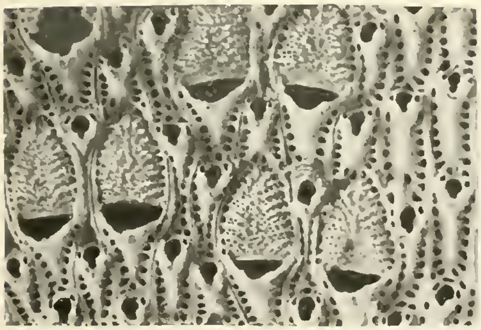
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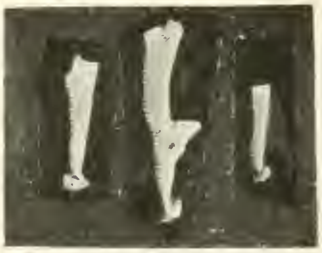
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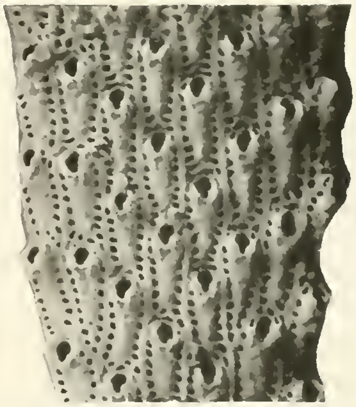
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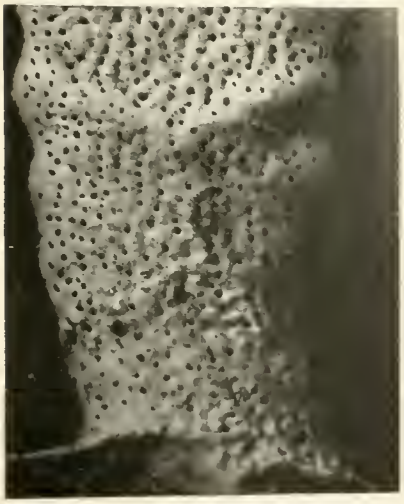
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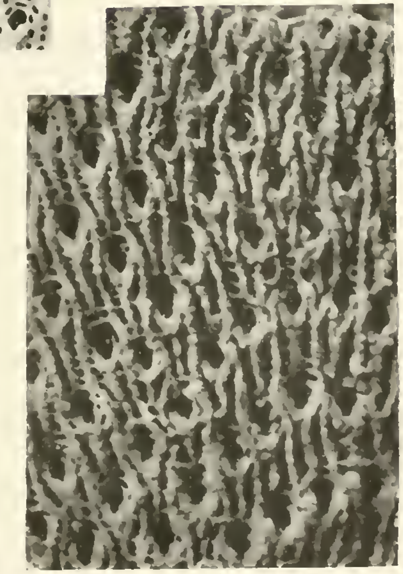
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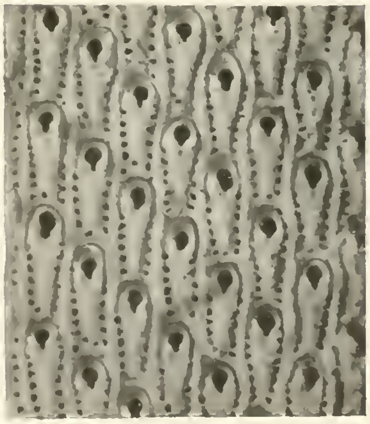
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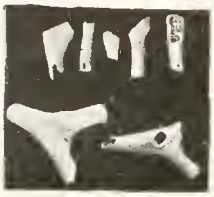
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 248.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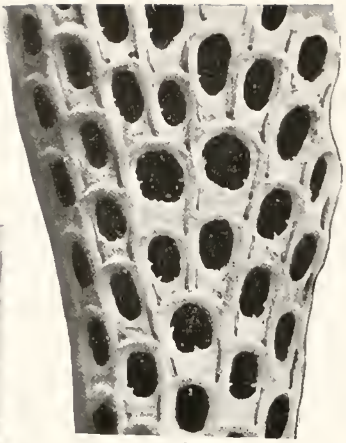
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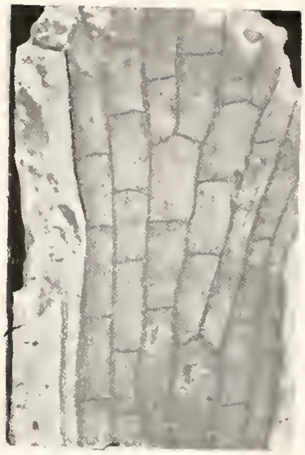
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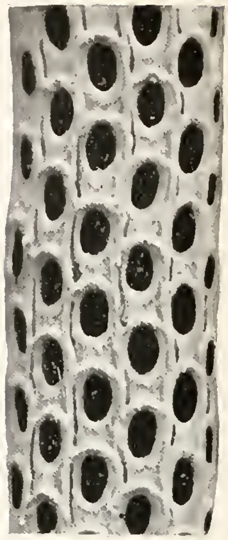
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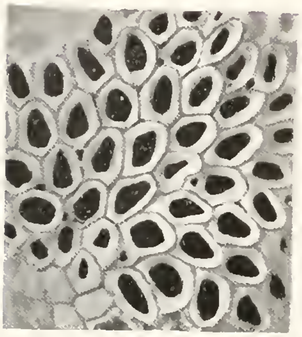
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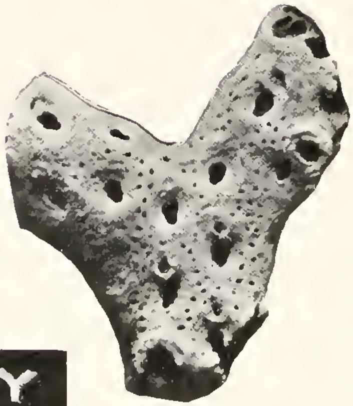
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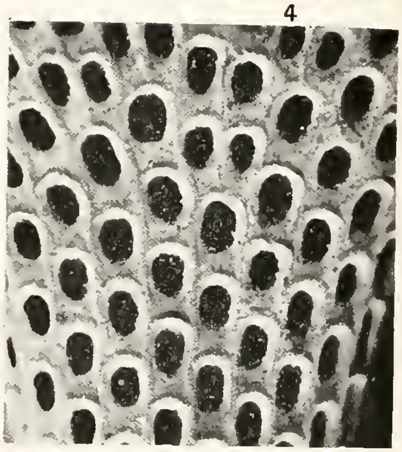
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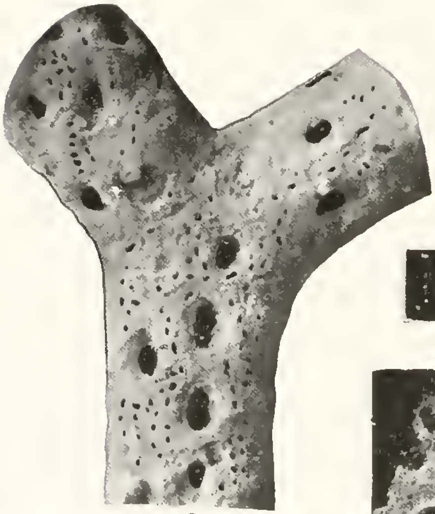
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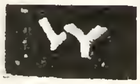
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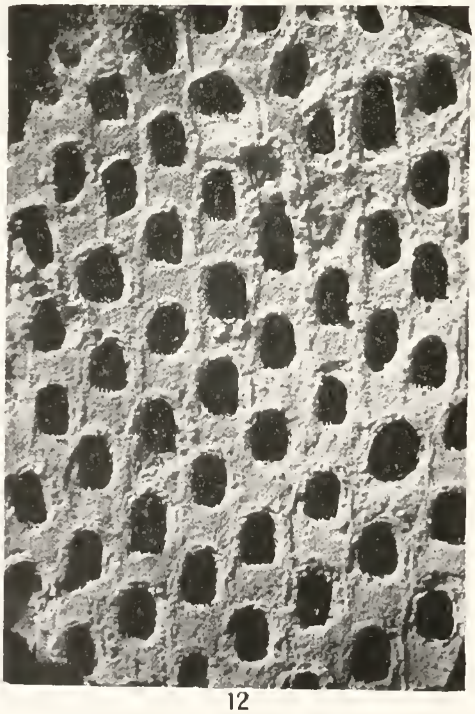
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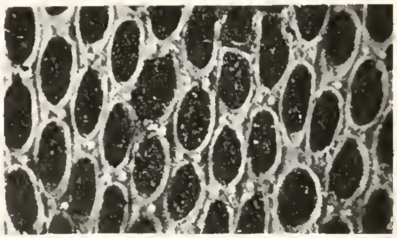
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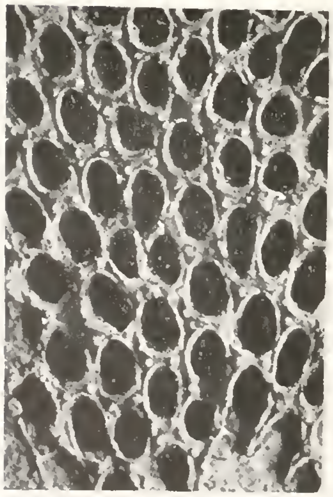
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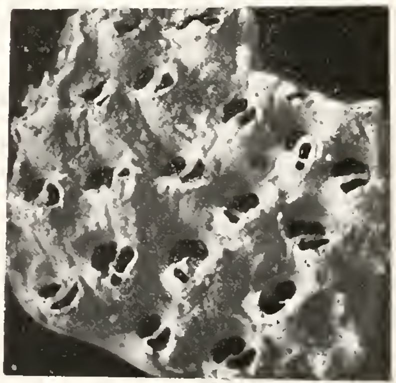
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 249.

PLATE 5.

FIGS. 1–5. *Acanthodesia savarti* forma *texturata* Reuss, 1847. (See also pl. 46, figs. 8, 9.) (p. 32.)

1. Fragments of the unilamellar, hollow cylindrical zoarium, natural size.
2. Zooecia, × 20, with traces of delicate spines in the opesium.
3. Inner side of zoarium, × 20, showing rectangular form of zooecia.
4. Zooecia, × 20, with a distinct rim around the opesium.
5. Another surface, × 20, showing the large size of the first zooecium of a new row.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIG. 6. *Conopeum ovale* Canu and Bassler, 1919. (p. 26.)

Ancestrular portion of the type specimen, × 20, incrusting a shell. The rare and irregular interopesial cavities, the entire, oval opesium and the flat mural rim are illustrated.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIGS. 7–9. *Gemelliporella punctata* Canu and Bassler, 1919. (p. 111.)

7. Two fragments of the free cylindrical zoarium, natural size.
8. An example, × 20, showing the development of the tremocyst.
9. Another fragment, × 20, exhibiting the form of the aperture, ovicells (broken) and arrangement of the areolae.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIGS. 10–11. *Membraniporina tenella* Hincks, 1880. (p. 24.)

10. The incrusting zoarium, × 20, illustrating the thin mural rim and the small tubercles on the gymnocyst.
11. Another zoarium, × 20, with narrow zooecia.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIG. 12. *Hemiseptella grandicella* Canu and Bassler, 1919. (p. 71.)

Surface of the incrusting zoarium, × 20. The largest zooecia commence a new row.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIG. 13. *Rhamphostomella laticella* Canu and Bassler, 1919. (p. 151.)

The incrusting zoarium, × 20. The areolar costules are scarcely visible.

Lower Miocene (Bowden marl): Bowden, Jamaica.

PLATE 6.

FIG. 1. *Labiopora miocenica* Canu and Bassler, 1919. (p. 67.)

Fragment of the unilamellar zoarium, × 20. The polypidian tube and the small pores of the tremocyst are visible.

Lower Miocene (Bowden horizon): Rio Gurabo, Santo Domingo.

FIG. 2. *Hippomenella infratelum* Canu and Bassler, 1919. (p. 132.)

Base of the bilamellar zoarium, × 20. One zooecium is regenerated, being replaced by an avicularium.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

FIGS. 3–5. *Schizopodrella mutabilis* Canu and Bassler, 1919. (p. 105.)

3. The tubular zoarium, natural size.
4. Surface, × 20, showing indistinct zooecia.
5. Another portion of the same zoarium, × 20, illustrating the shape of the zooecia.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

FIGS. 6–9. *Steganoporella parvicella* Canu and Bassler, 1919. (p. 62.)

6. Fragments of the unilamellar zoarium, natural size.
7. Zoarial fragment, × 20, illustrating the great irregularity in the zooecia.
8. The usual zooecia, × 20, with regular arrangement.
9. The most frequent aspect of the zooecia, × 20. The polypidian tube is very fragile and often broken or altered.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

FIGS. 10–15. *Thalamoporella biperforata* Canu and Bassler, 1919. (p. 62.)

10. Fragments of the bilamellar zoarium, natural size.
11. Specimen, × 20, exhibiting a well-preserved reticulocellarium.
12. An example, × 20, showing the hollow tubercles worn and replaced by pores. A reticulocellarium is here present.
13. Drawing showing the real form of the aperture, × 77.
14. A specimen, × 20, with a deformed membraniporoid zooecium near the upper corner.
15. Another similar example, × 20, with a primoserial membraniporoid zooecium along the lower edge.

Lower Miocene (Bowden horizon): Cercado de Mao and Rio Cana, Santo Domingo.

FIGS. 16–19. *Mamillopora tuberosa* Canu and Bassler, 1919. (See also pl. 7, figs. 1–8.) (p. 192.)

16. Small fragments of the small, free, conical zoarium, natural size.
17. Zoarial fragment, × 20, with large zooecia.
18. Fragment, × 20, with small zooecia. The tubercles are well developed.
19. Inner side of zoarium, × 20.

Lower Miocene (Bowden horizon): Rio Cana, Santo Domingo.

FIGS. 20, 21. *Diaperoecia milneana* D'Orbigny, 1839. (p. 202.)

Views of a fragment, natural size and × 12, referred to this species.

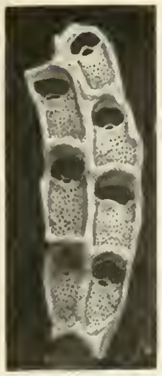
Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.

FIGS. 22, 23. *Adeona porosa* Canu and Bassler, 1919. (p. 158.)

Fragment of the free bilamellar zoarium, natural size and × 20.

In figure 23, three gonoecia with their oral gibbosities are shown in the upper right-hand corner, an avicularian zooecium in the upper left-hand corner, and ordinary zooecia with their ascopores, and small areolae in the rest of the photograph.

Lower Miocene (Bowden horizon): Cercado de Mao, Santo Domingo.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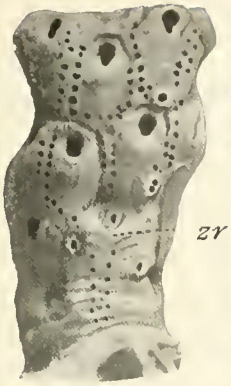

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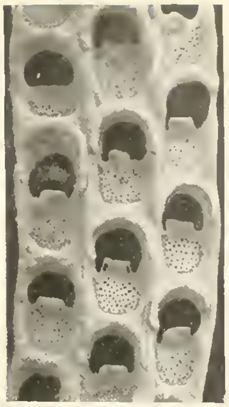
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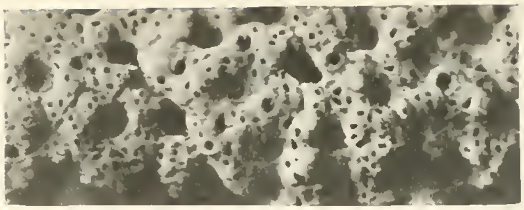
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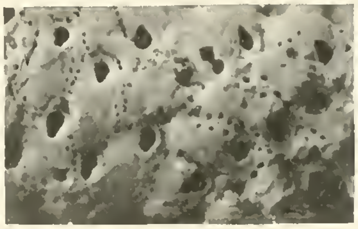
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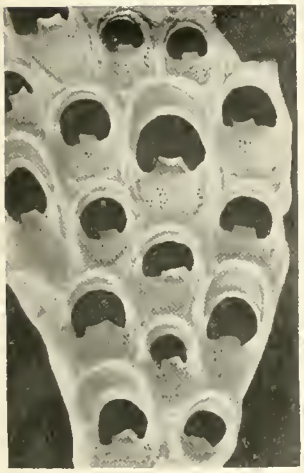
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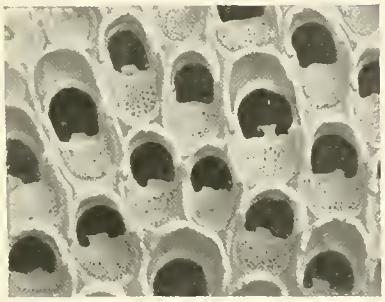
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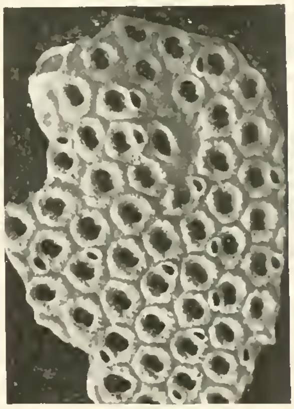
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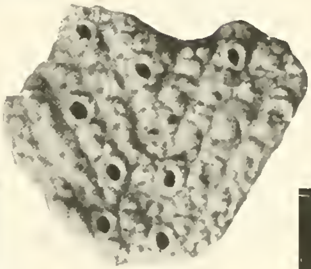
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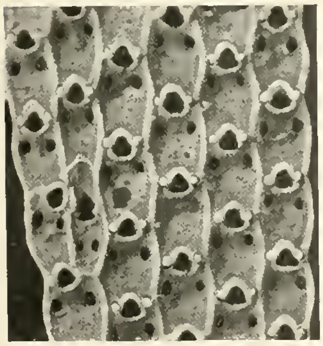
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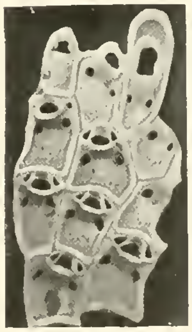
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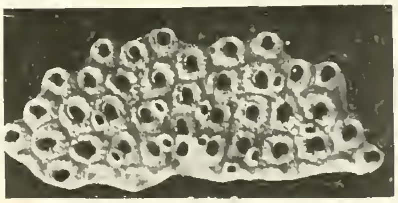
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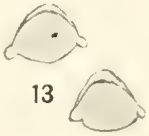
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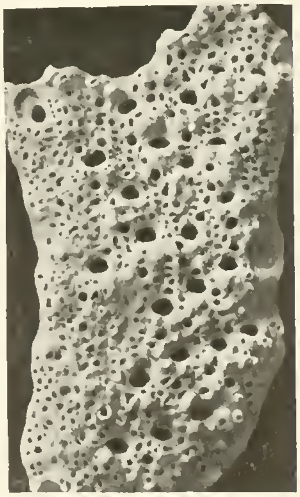
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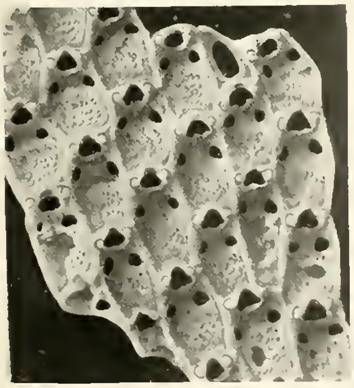
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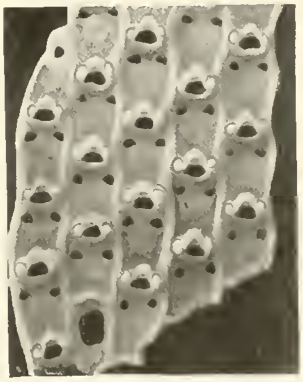
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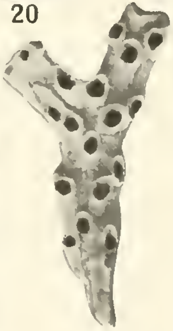
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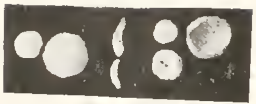
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 250.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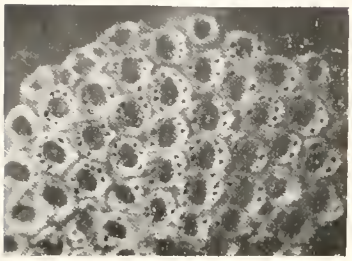
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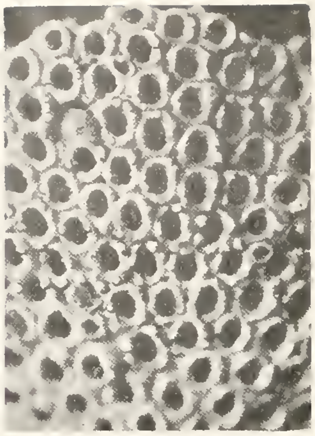
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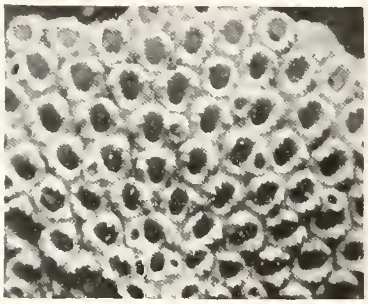
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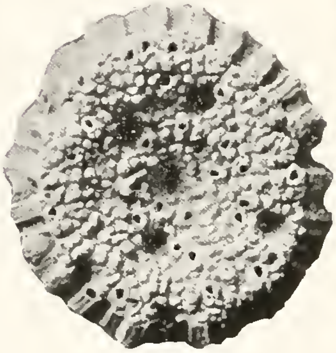
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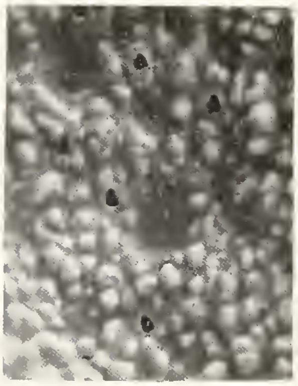
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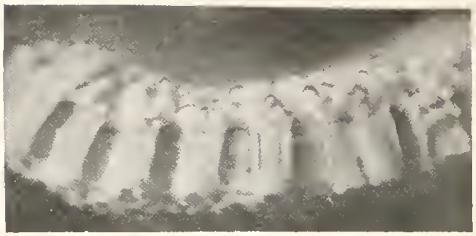
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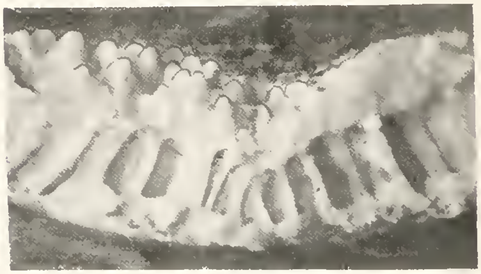
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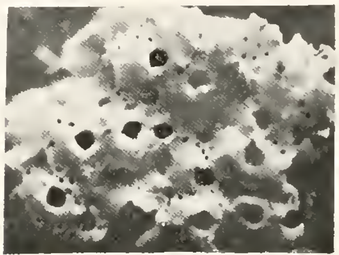
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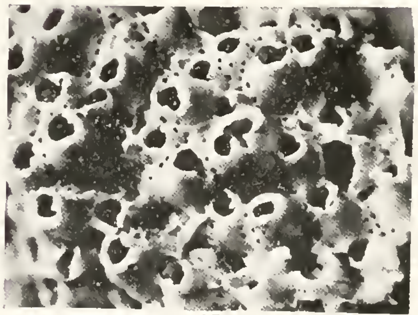
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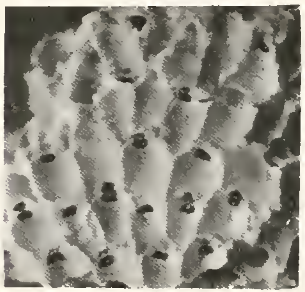
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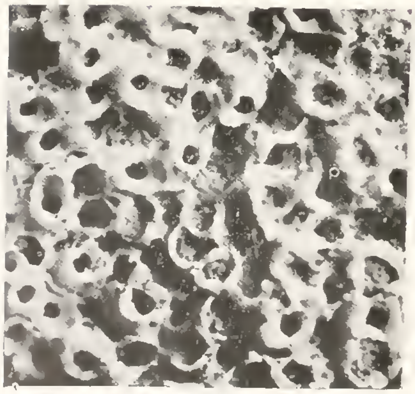
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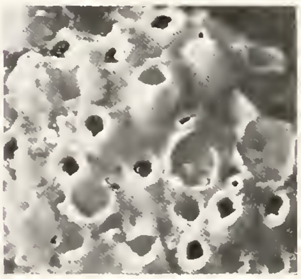
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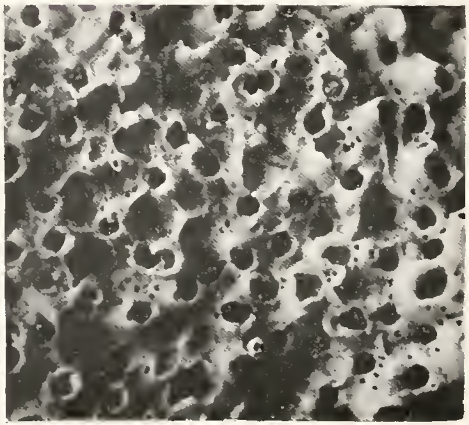
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 251

Plate 7.

Figs. 1–8. *Mamillopora tuberosa* Canu and Bassler, 1919. (See also pl. 6, figs. 16–19.) (p. 192.)

1. Group showing the upper, lower, and edge views of the zoarium, natural size.
2. Zoarium with weathered surface, × 20, illustrating that the tuberosities are hollow.
3. Zooecia, × 20, with one preserving the ovicell, which is hyperstomial and closed by the operculum.
4. Portion of a zoarium, × 20, with the tuberosities around the zooecial apertures well preserved
5. Inner surface of zoarium, × 10. The tuberosities, avicularia, and hydrostatic (?) cavities are visible.
6. Portion of figure 5, × 20.
7. Edge view of fractured zoarium, × 20, illustrating zooecia open.
8. Similar view, × 20, but with the zooecia closed.

Lower Miocene (Bowden marl): Bowden, Jamaica.

Figs. 9–14. *Holoporella albirostris* Smitt, 1872. (See also pl. 32, figs. 6–10.) (p. 174.)

9. Fragment, × 20, showing zooecia without beak with the typical form of aperture.
10. Zooecia, × 20, showing interzooecial avicularia. The oral beak is incomplete and in process of formation.
11. Interior of zooecia, × 20.
12. General aspect of the zooecia with ovicell, × 20.
13. Marginal zooecia, × 20. The deep zooecia have a beak bearing a small avicularium which appears then as isolated.
14. Zooecia, × 20, showing the different aspects of the beak when broken.

Lower Miocene (Bowden marl): Bowden, Jamaica.

Plate 8.

Figs. 1–10. *Metrarabdotos lacrymosum* Canu and Bassler, 1919. (p. 164.)

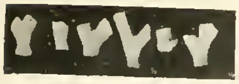
1. A group of fragments, natural size.
2. Fragment, × 6, showing the little expanded base.
3. Another fragment, × 6.
4. A worn branch, × 20. The avicularia are absent or little apparent.
5. Zooecia, × 20, with salient peristomes and large triangular avicularia.
6. Worn zoarial fragment, × 20.
7. Ordinary zooecia of a branch, × 20, with short, pointed triangular avicularia.
8. Ordinary zooecia, × 20, with long avicularia.
9. Branch, × 20, with ovicelled zooecia. The ovicell is slightly costulated and its frontal is granulose.
10. Ovicelled zooecia, × 20, with the ovicell not costulated.

Lower Miocene (Bowden marl): Bowden, Jamaica.

Figs. 11–16. *Bracebridgia deformis* Canu and Bassler, 1919. (p. 160.)

11. Fragments, natural size.
12. The usual aspect of the zooecia, × 20. The large frontal pore does not perforate the wall.
13. Zooecia at the base of a zoarium, × 20.
14. Zooecia, × 20 with the large frontal pore wanting.
15. Zooecia, × 20, with the peristomial avicularium slightly visible.
16. Interior of zooecia, × 20. The peristomial avicularium is visible, but the frontal pore does not perforate the zooecial wall.

Lower Miocene (Bowden marl): Bowden, Jamaica.



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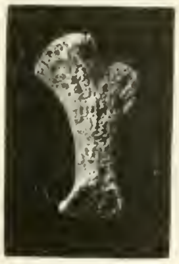

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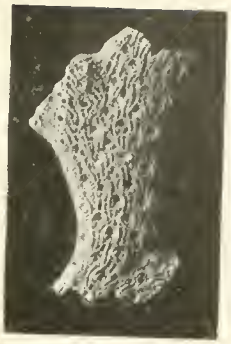

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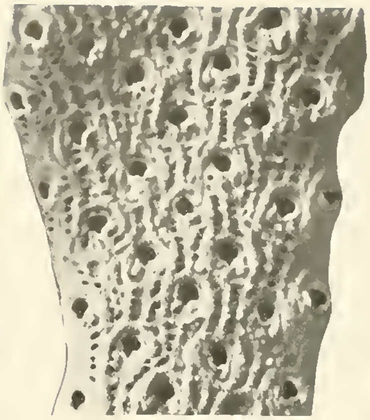

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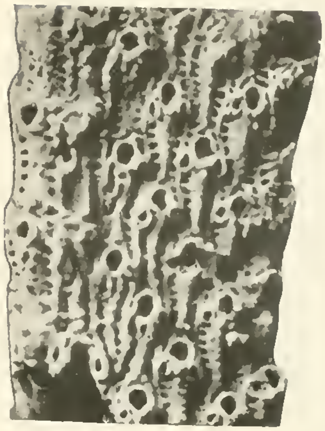

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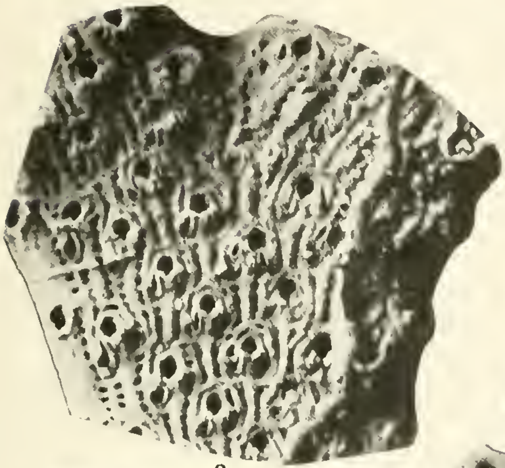

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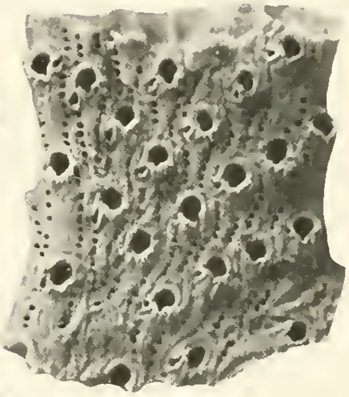

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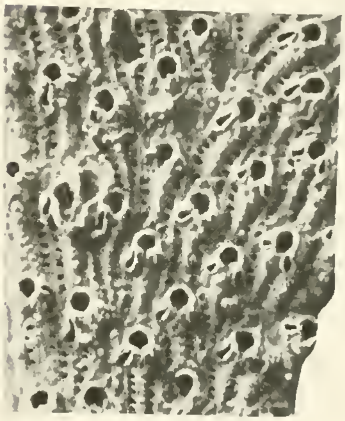

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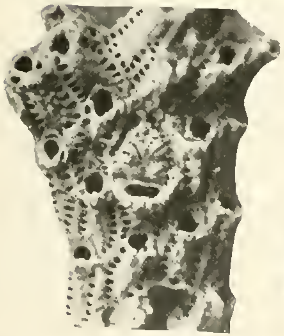

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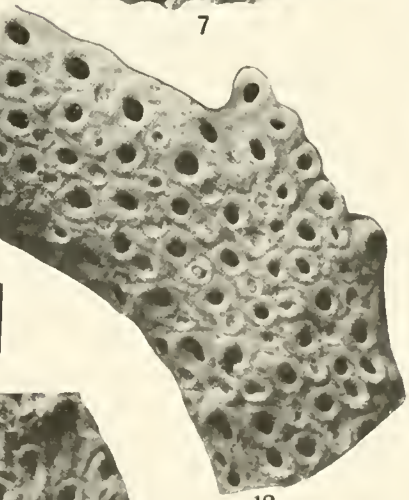

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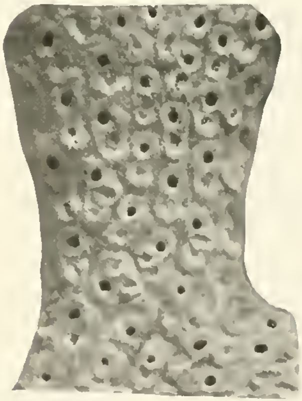

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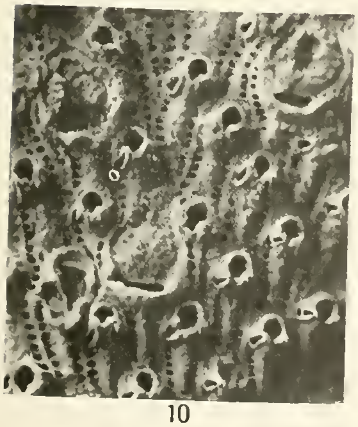

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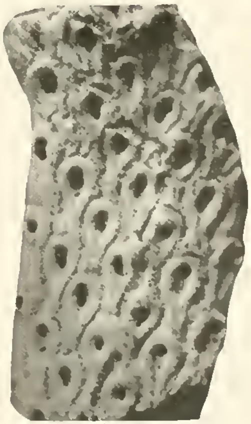

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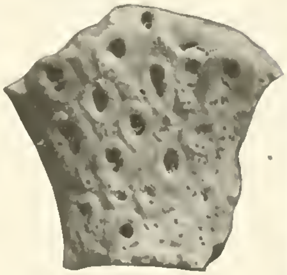

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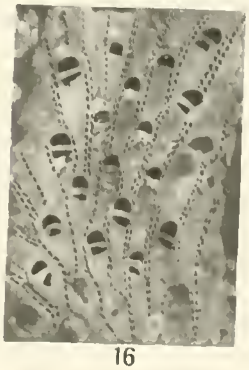

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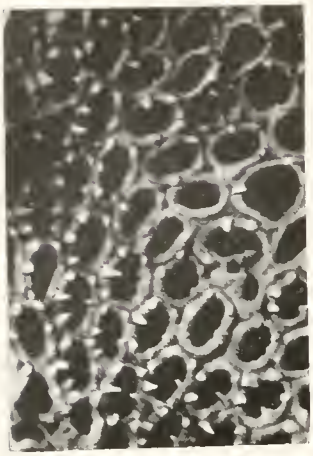
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 252.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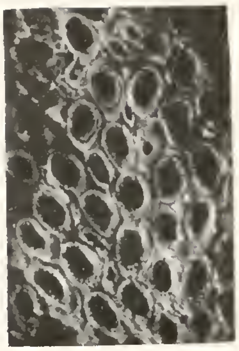
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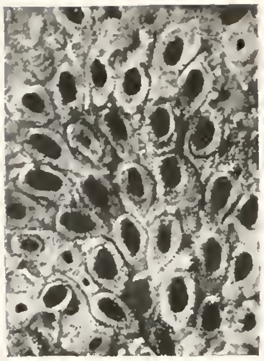
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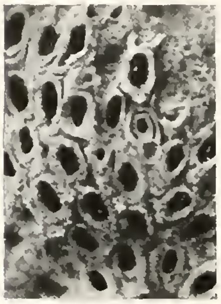
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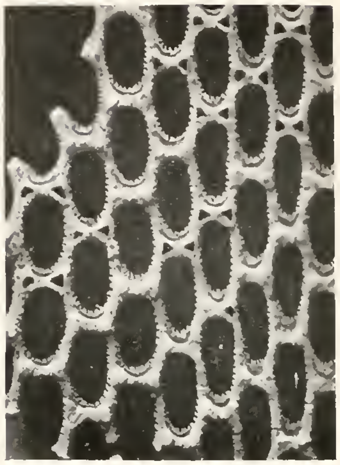
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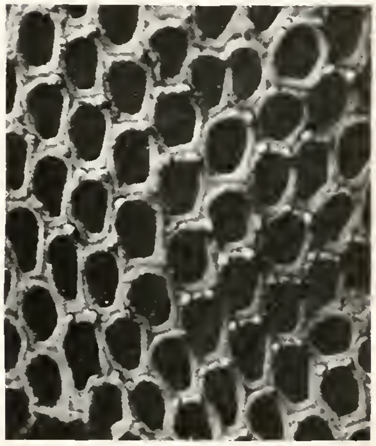
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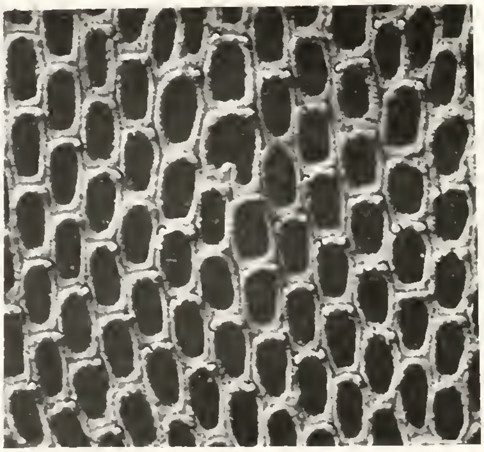
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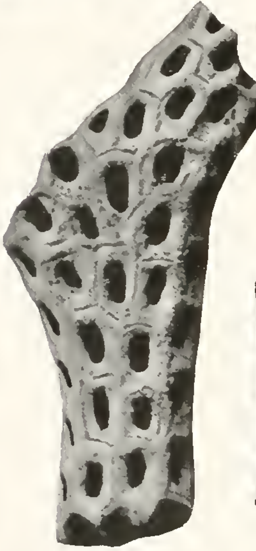
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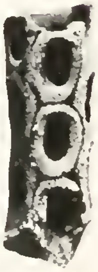
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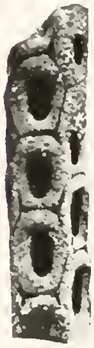
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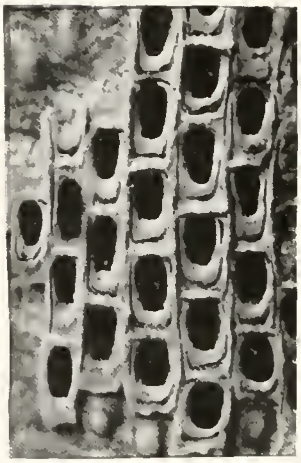
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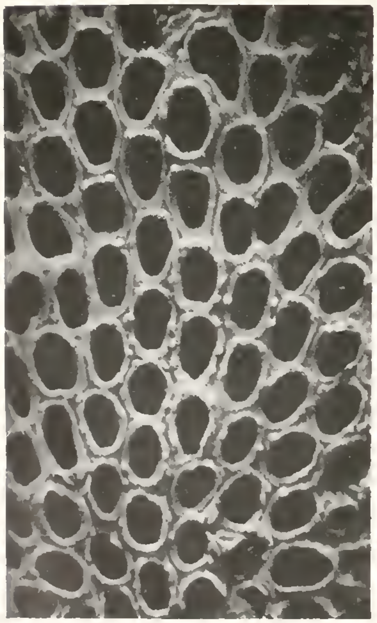
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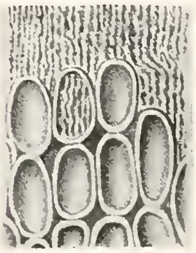
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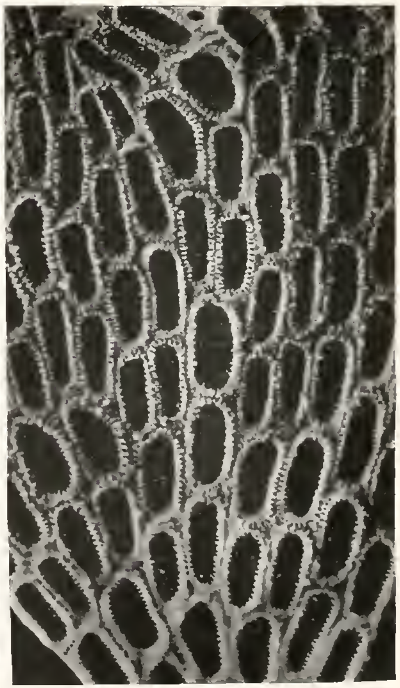
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 253.

PLATE 9.

FIG. 1. *Membranipora spiculata*, new species. (p. 21.)

Zooecia of the incrusting type specimen, × 20, showing the curved spicules.

Miocene: Kuhns, Carteret County, North Carolina.

FIGS. 2–4. *Pyripora brevicauda*, new species. (p. 19.)

2. Portion of the zoarium × 20, showing several of the fusiform heterozooecia.

3. Another zoarium × 20, illustrating the flabelliform growth. Normal and deformed zooecia are present.

4. Zooecia, × 20, with several calcified ones present.

Miocene: Kuhns, Carteret County, North Carolina.

FIG. 5. *Conopeum nitidulum* Ulrich and Bassler, 1904. (p. 27.)

View of the type specimen × 20 illustrating the small flat cryptocyst and the triangular interopesial spaces.

Miocene (Choptank formation): Pawpaw Point, Maryland.

FIGS. 6, 7. *Membranipora fossulifera* Ulrich and Bassler, 1904. (p. 20.)

6. An irregular specimen × 20 showing the large interzooecial tubercles, the small spines on the mural rim and some zooecia without tubercles.

Miocene: Kuhns, Carteret County, North Carolina.

7. Photograph × 20 of the type specimen.

The median channel between the walls, giving rise to the specific name, is apparent.

Miocene (Calvert formation): Reeds, Maryland.

FIGS. 8–10. *Membraniporina vincularina*, new species. (p. 26.)

8. A bilamellar zoarium, × 20, referred to this species.

Miocene (Yorktown formation): Petersburg, Virginia.

9, 10. The types of the species, fragments of the free rod-like zoaria, × 20.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

FIG. 11. *Acanthodesia rectangularia*, new species. (p. 34.)

The incrusting type specimen × 20, showing the rectangular zooecia with deep cryptocyst.

Miocene (Yorktown formation): Petersburg, Virginia.

FIG. 12. *Membranipora tuberimargo*, new species. (p. 23.)

Portion of the type specimen × 20 showing both ancestrula and normal zooecia. The single pair of distal tubercles and two pairs of lateral ones are quite visible on some zooecia.

Miocene (St. Mary's formation): Cove Point, Maryland.

FIG. 13. *Membranipora speciosa*, Gabb and Horn, 1862. (p. 44.)

The original figure of this undetermined species.

Miocene? Chiriqui, Central America.

FIG. 14. *Membraniporina baccata*, new species. (p. 25.)

The incrusting, unilamellar zoarium, × 20, illustrating the numerous granules of the mural rim.

Miocene (St. Mary's formation): Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia.

PLATE 10.

FIGS. 1–3. *Acanthodesia oblongula* Ulrich and Bassler, 1904. (p. 34.)

1. One of the original types of this incrusting species, × 20, illustrating the prominent interzooecial tubercles and the spinose processes (spicules) surrounding the opesium.

Miocene (Calvert formation): Plum Point, Maryland.

2. A specimen, × 20, showing the interzooecial tubercles joined.

Miocene (Choptank formation): Pawpaw Point, Maryland.

3. Another of the original types, × 20, in which there are numerous spinose processes but with the interzooecial tubercles little developed.

Miocene (Choptank formation): Governor Run, Maryland.

FIGS. 4–5. *Vibracellina pusilla*, new species. (p. 35.)

4. Ancestrular region of the incrusting zoarium, × 20.

Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, North Carolina.

5. A well-developed zoarium, × 20, illustrating normal and regenerated zooecia and the small but salient vibracula.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.

FIGS. 6–7. *Vibracellina simplex*, new species. (p. 35.)

6. The incrusting zoarium, × 20, showing the ancestrular region. The vibracula are very rare but heterozooecia are present.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

7. A small zoarium, × 20, showing the calcified ancestrula which engenders five zooecia. Several regenerated zooecia are present.

Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, North Carolina.

FIG. 8. *Conopeum germanum* Ulrich and Bassler, 1904. (p. 27.)

The incrusting type specimen, × 20, illustrating the interopesial cavities and other characteristics.

Miocene (Choptank formation): Dover Bridge, Maryland.

FIG. 9. *Hemiseptella filimargo*, new species. (p. 71)

The incrusting type specimen, × 20. The salient rim separating the zooecia and the two large lateral as well as the smaller spicules of the opesium are evident.

Miocene (Yorktown formation): York River, Virginia.

FIG. 10–14. *Membranipora flabellata* Canu, 1904. (p. 20.)

10. Surface of an outer lamella, × 20, with the tubercles worn away and the zooecia grouped around a false ancestrula.

Miocene (Yorktown formation): Yorktown, Virginia.

11. Portion of a zoarium, × 20, with the zooecia separated by interopesial cavities.

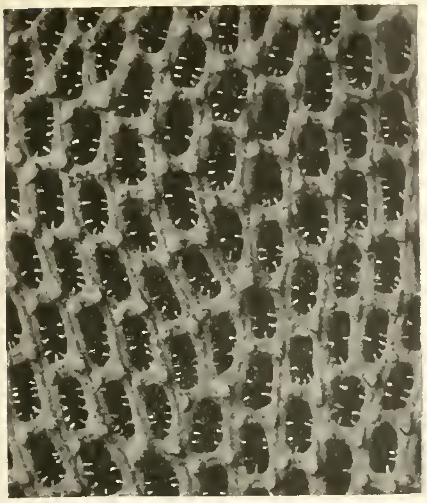
12. Young zooecia, × 20, with thin mural rims. Other zooecia of this same zoarium are normal, tuberose or separated by interopesial cavities.

13. Zooecia, × 20, with granulose mural rims.

Miocene (Yorktown formation): Near Suffolk, Virginia.

14. Photograph of an inner lamella, × 20, with the tubercles preserved.

Miocene (Yorktown formation) Yorktown, Virginia.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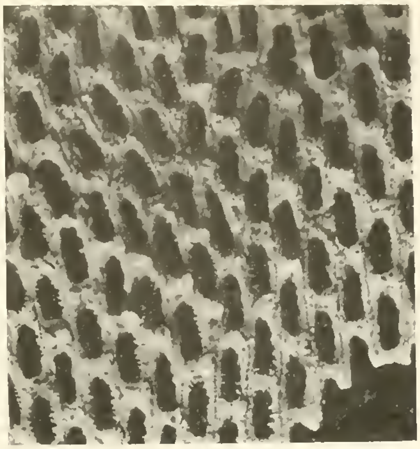
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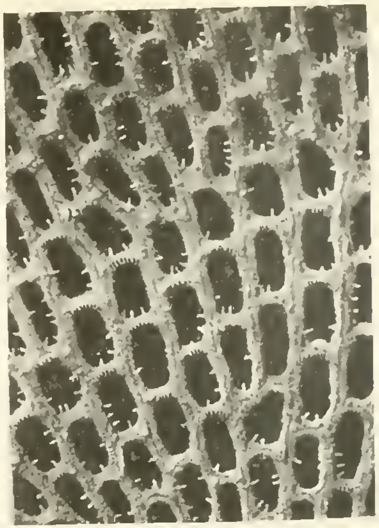
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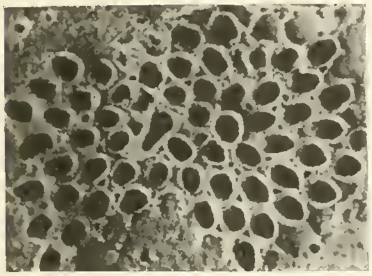
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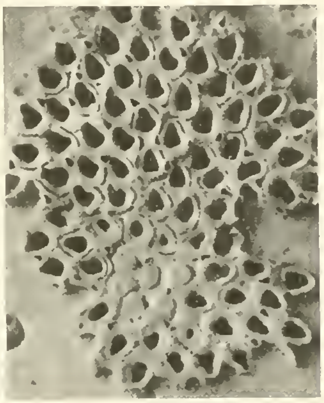
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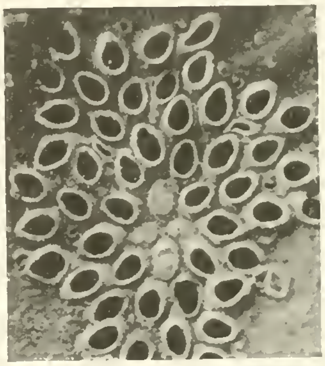
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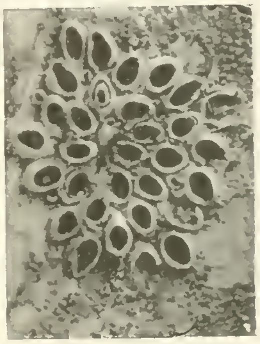
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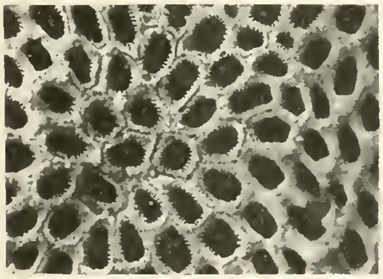
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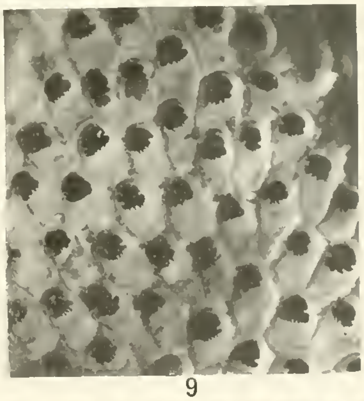
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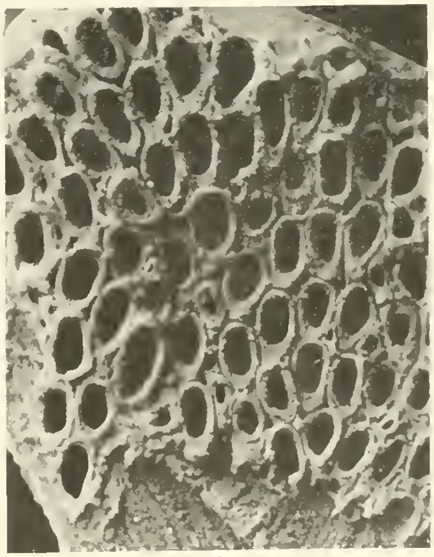
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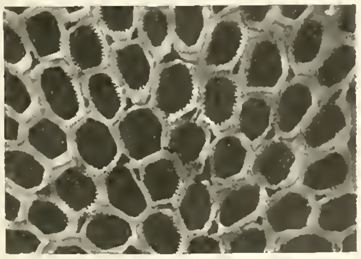
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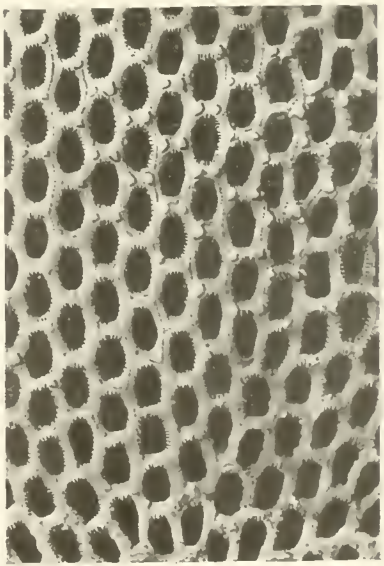
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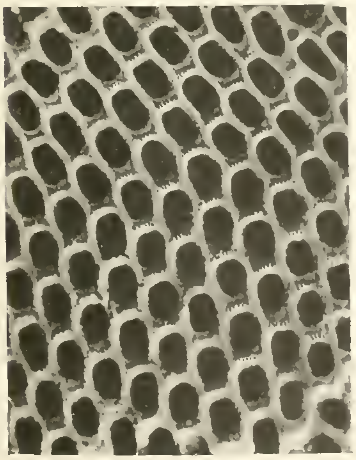
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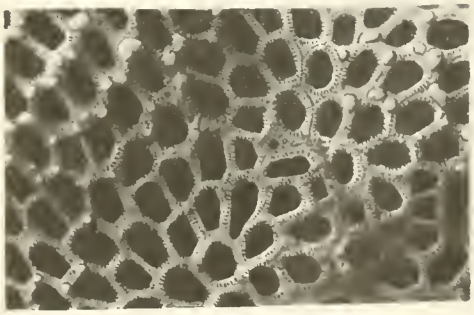
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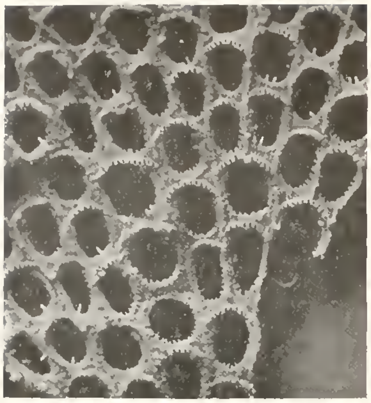
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 254.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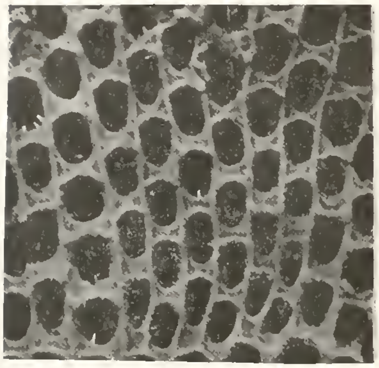
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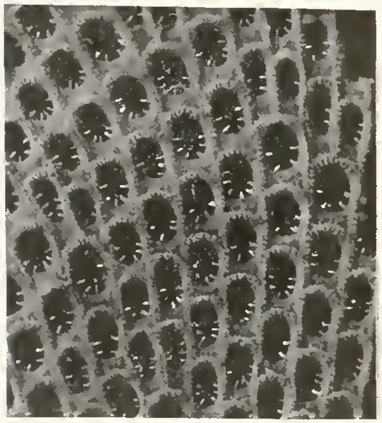
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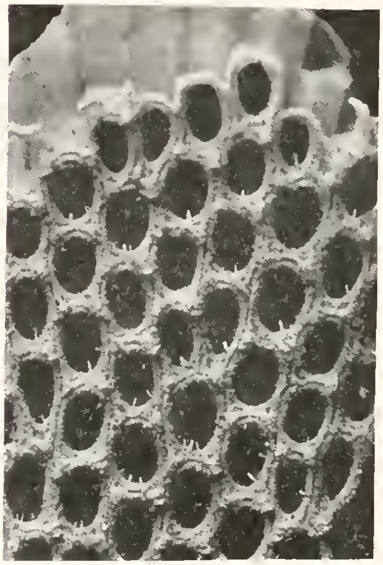
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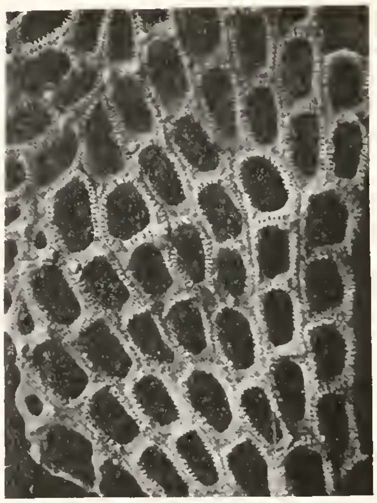
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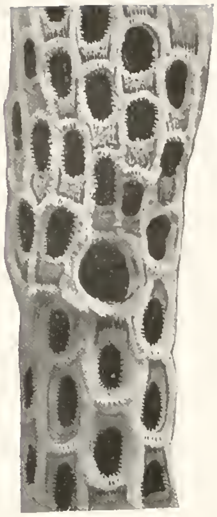
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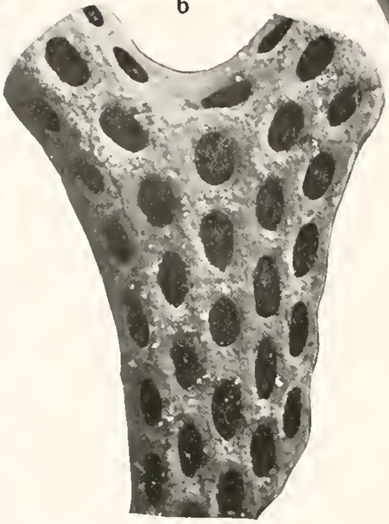
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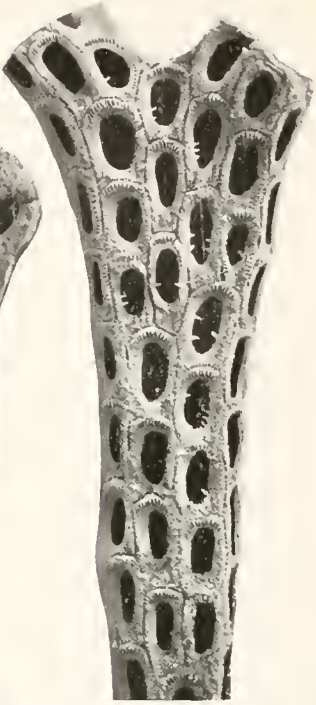
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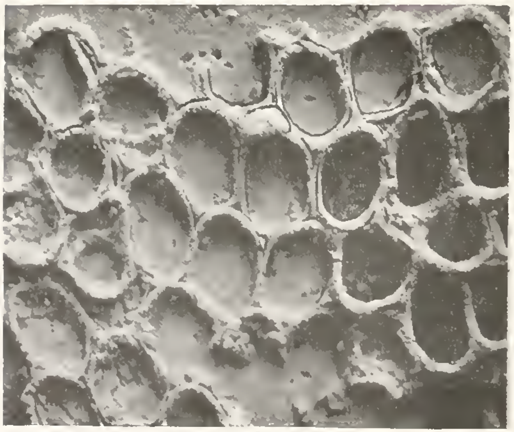
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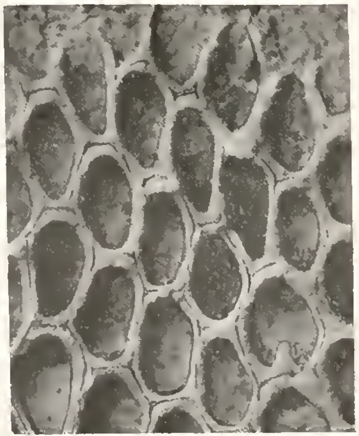
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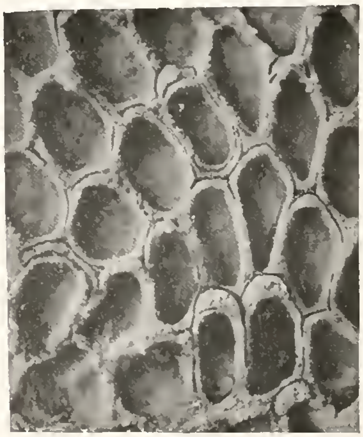
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 255.

PLATE 11.

FIGS. 1–3. *Acanthodesia savarti* Audouin, 1826, forma *typica*. (p. 31.)

1. An incrusting specimen × 20, of the typical form of the species, illustrating the considerable micrometric variations. Traces of the spicules in the opesium are visible.

Miocene: Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia.

2. An example × 20, with young zooecia.

3. Surface of a free, multilamellar zoarium, × 20, with numerous spicules, in the opesium.

Miocene (Yorktown formation): Near Suffolk, Virginia.

FIG. 4. *Acanthodesia savarti* forma *bifoliata* Ulrich and Bassler, 1904. (p. 33.)

Surface of the bilamellar type zoarium, × 20, showing the thin mural rim, the absence of the cryptocyst, the tubercles at the angles and and spicules in the opesium.

Miocene (Choptank formation): Jones Wharf, Maryland.

FIGS. 5–9. *Acanthodesia savarti* forma *delicatula* Busk, 1859. (p. 33.)

5. An incrusting example, × 20, referred to this form.

Miocene: Bowler's wharf, 18 miles above Urbana, Virginia.

6. Zoarial fragments, natural size.

7. A branch, × 20, on which the zooecia are developed in opposite directions.

8. Another branch, × 20, in which the cryptocyst is small and the superficial ornament is obscured by fossilization.

9. A well preserved branch, × 20, showing the unequal development of the cryptocyst.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

FIGS. 10–12. *Membrendoecium grande*, new species. (p. 36.)

10. Portion of the zoarium × 20, with irregular zooecia, one showing the endozooecial ovicell.

Miocene (Duplin marl): Wilmington, North Carolina.

11. Marginal, elongated zooecia, × 20.

12. Another portion of the same zoarium × 20, with several ovicelled zooecia.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

PLATE 12.

FIGS. 1, 2. *Membrendoecium parvicapitatum*, new species. (p. 36.)

1. The incrusting type specimen × 20, with ancestrular, normal, ovicelled and regenerated zooecia.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

2. An Early Miocene specimen, × 20, referred to this species.

Lower Miocene (Bowden marl): Bowden, Jamaica.

FIG. 3. *Callopora parvirostris*, new species. (p. 41.)

A portion of the type specimen, × 20, with normal and ovicelled zooecia, exhibiting the small, triangular, suberect avicularium.

Miocene (Calvert formation): 1 mile south of Parkers Creek, Calvert County, Maryland.

FIGS. 4–5. *Alderina cesticella*, new species. (p. 39.)

4. Ancestrular region of the incrusting zoarium, × 20, showing regenerated, calcified and ovicelled zooecia. The ovicells have a prominent collar.

5. Another view of the same zoarium, × 20, exhibiting regenerated zooecia and numerous salient spines on the zooecial walls.

Miocene (Duplin marl): Natural Well, 2 miles southwest Magnolia, Duplin County, North Carolina.

FIG. 6. *Ogivalina parvula* Ulrich and Bassler, 1904. (p. 37.)

The incrusting type specimen × 20. A small cryptocyst and often a small convex gymnocyst are present.

Miocene (Calvert formation): Reeds, Maryland.

FIG. 7. *Membraniporidra parva*, new species. (p. 39.)

The imperfect type specimen, × 20, with two ovicelled zooecia.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

FIGS, 8, 9. *Dakaria torquata* D'Orbigny, 1839. (p. 98.)

8. Portion of the incrusting zoarium, × 20, with ovicelled zooecia.

9. Normal zooecia, × 20, illustrating the characteristic broad sinus.

Miocene (Yorktown formation): 3 miles southwest of Petersburg, Virginia.

FIG. 10. *Hippodiplosia bigibbera*, new species. (p. 131.)

The incrusting zoarium, × 20, showing the aperture deformed by two frontal gibbosities.

Miocene (Yorktown formation): 3 miles southwest of Petersburg, Virginia.

FIG. 11. *Callopora lanceolata*, new species. (p. 41.)

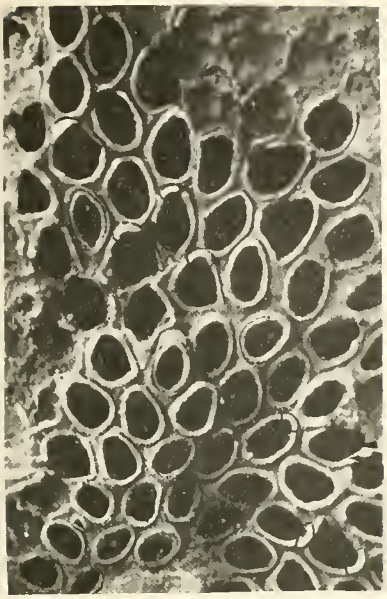
The incrusting type specimen, × 20, showing ovicelled and normal zooecia, diatellae and the large lanceolate avicularia.

Miocene (Yorktown formation): 3 miles southwest of Petersburg, Virginia.

FIG. 12. *Callopora dumerilii* Savigny-Audouin, 1826. (See also pl. 1, fig. 2; pl. 2, fig. 23.) (p. 40.)

Photograph of a specimen, × 20, referred to this species.

Lower Miocene (Chipola marl): Chipola River, Calhoun County, Florida.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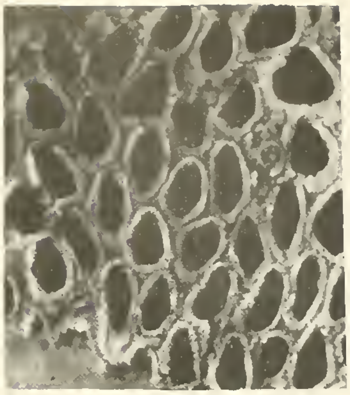
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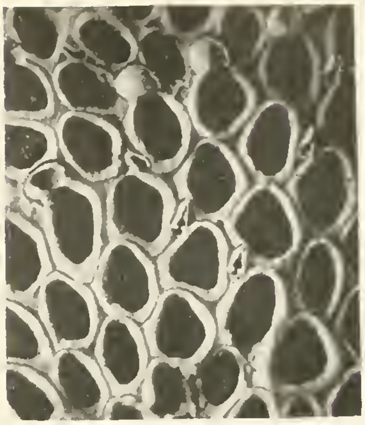
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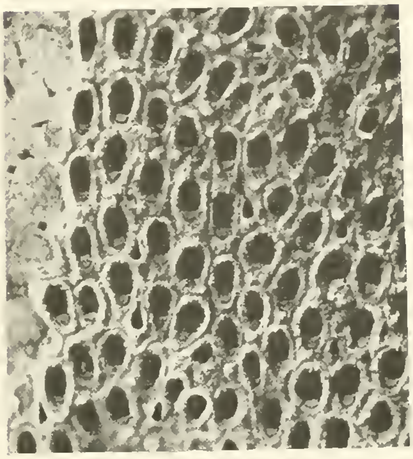
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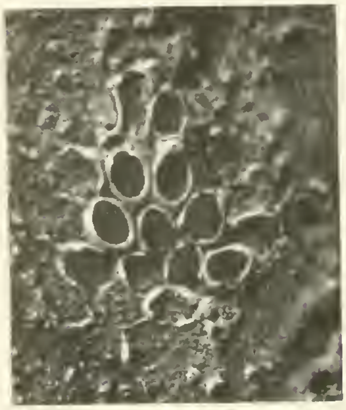
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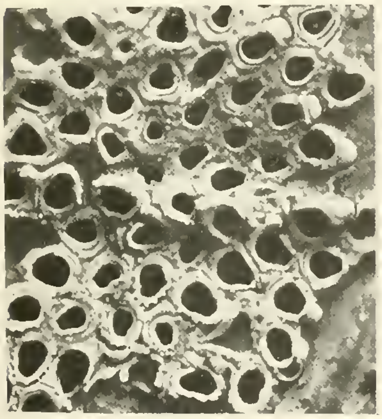
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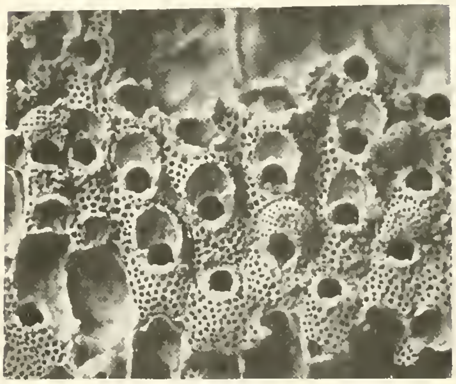
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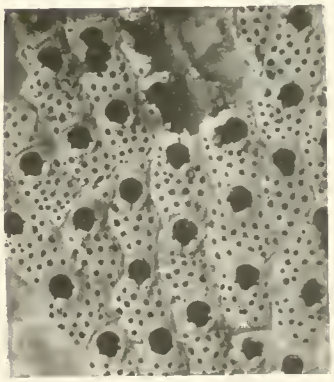
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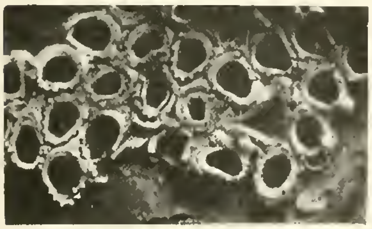
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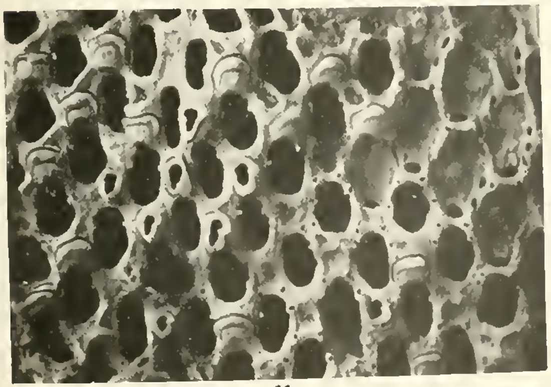
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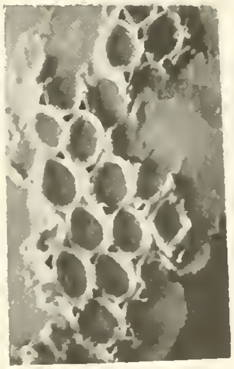
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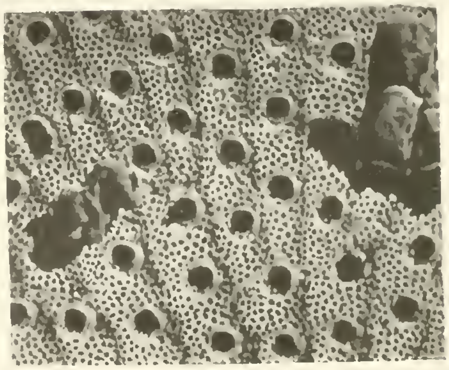
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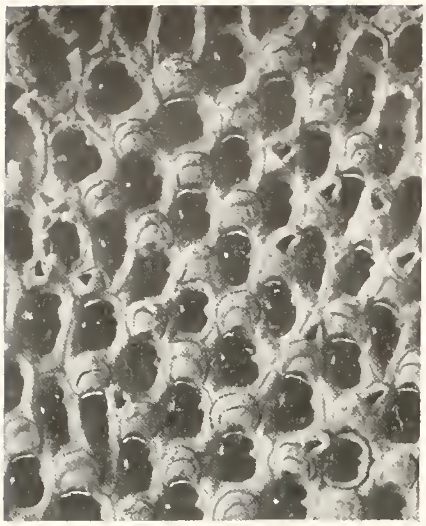
NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 256.



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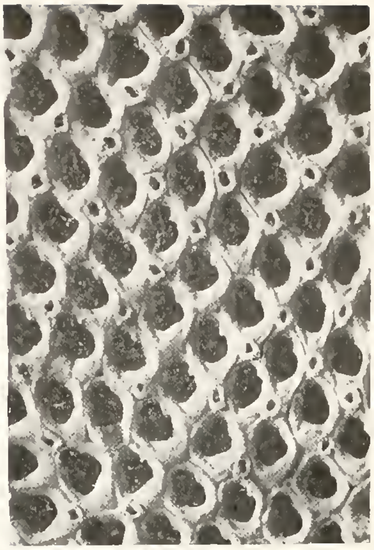

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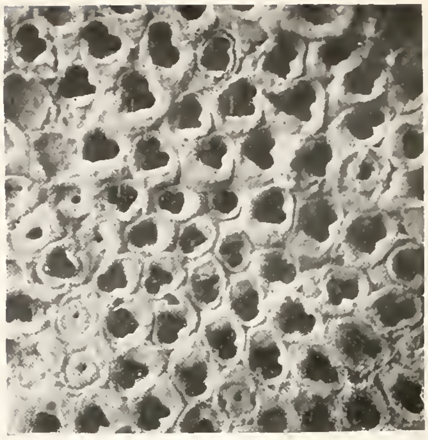

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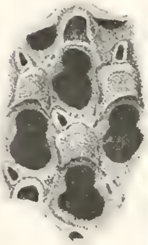

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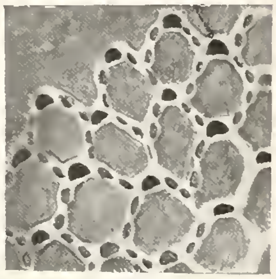

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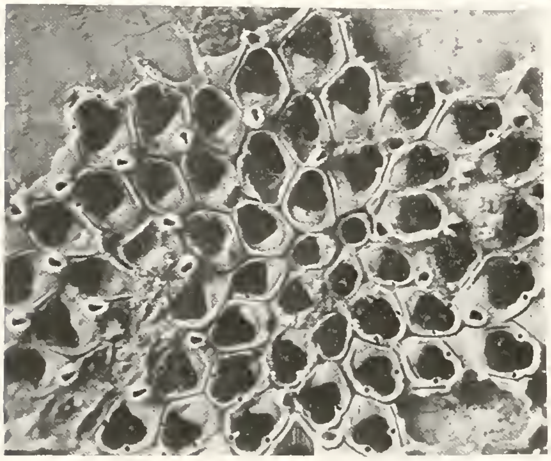

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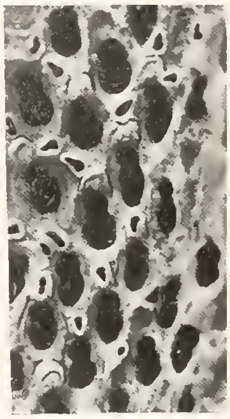

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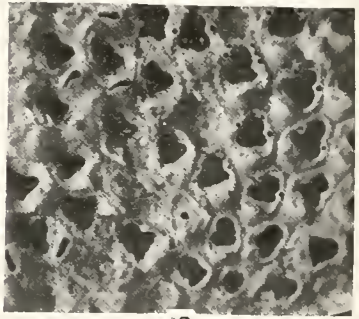

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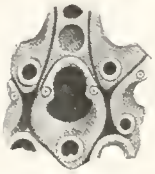

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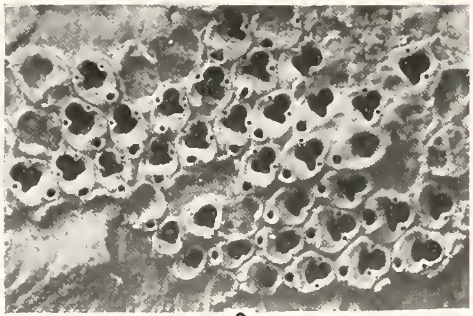

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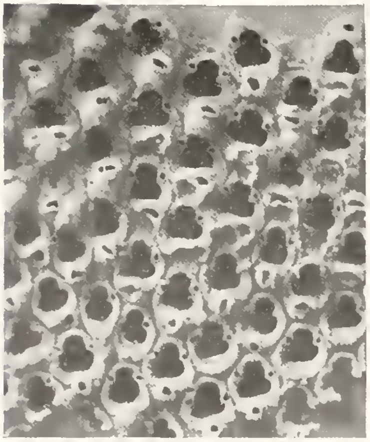

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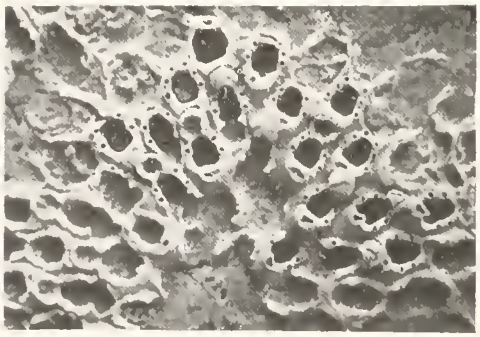

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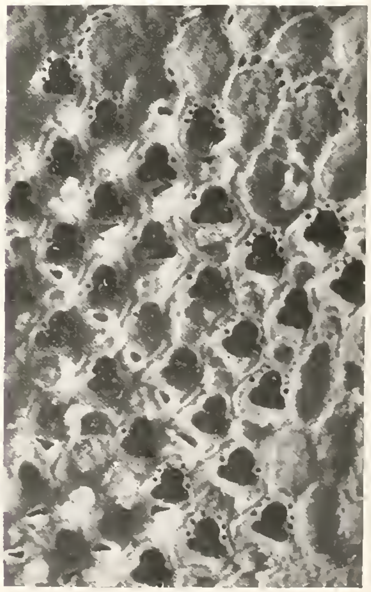


13

North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 257

PLATE 13.

FIGS. 1–6. *Amphiblestrum constrictum* Ulrich and Bassler, 1904. (p. 44.)

1. Portion of the incrusting zoarium, × 20, showing numerous ovicelled zooecia, a giant zooecium, and deformed primoserial zooecia.

2. Nonovicelled zooecia, × 20.

3. Zoarium, × 20, exhibiting the ancestrula, calcified zooecia and regenerated zooecia.

4. Worn zooecia, × 20, exposing the dietellae.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

5. Drawing of several zooecia of the type specimens, × 17.

6. A portion of the type specimen, × 20, showing zooecia with nontrifoliate opesia. The lateral condyles are replaced by serrate denticles.

Miocene (St. Mary's formation): Cove Point, Maryland.

FIG. 7. *Amphiblestrum tenuiparietis*, new species. (p. 45.)

The incrusting type × 20, showing the ancestrula and surrounding zooecia, all with thin mural rim.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

FIGS. 8–10. *Ramphonotus agellus* Ulrich and Bassler, 1904. (p. 47.)

8. The type specimen, × 20, showing the trifoliate opesium and the avicularia oriented in the zooecial axis.

9. Drawing of a zooecium of the same, more enlarged.

Miocene (St. Mary's formation): Cove Point, Maryland.

10. An example, × 20, containing both ovicelled and unovicelled zooecia.

Miocene (St. Mary's formation): Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia.

FIGS. 11–13. *Ramphonotus asperus*, new species. (p. 46.)

11. Specimen, × 20, showing ovicelled zooecia, unovicelled zooecia with 6 spines and worn zooecia exposing the dietellae.

12. The incrusting zoarium × 20, illustrating the ancestrular region with several calcified zooecia.

13. Another portion of the same specimen × 20, showing both ovicelled and unovicelled zooecia, and the dietellae.

Miocene (Yorktown formation) Yorktown, Virginia.

PLATE 14.

FIG. 1. *Chaperia parvispina*, new species. (p. 51.)

The type specimen × 20, illustrating the absence of large distal spines which are replaced by very small fragile ones.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

FIGS. 2–4. *Chaperia caminosa* Ulrich and Bassler, 1904. (p. 54.)

2. One of the original types, × 20, with ovicelled zooecia and the salient triangular avicularium well developed.

3. Another specimen not so well preserved, × 20, showing the ordinary zooecia.

4. View of a zoarium, × 20, with the ovicells broken.

Miocene (Choptank formation): Jones Wharf, Maryland.

FIG. 5. *Velumella elongata*, new species. (p. 58.)

The incrusting zoarium, × 20, with large, elongated zooecia, several of which show the ovicell.

Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, North Carolina.

FIG. 6. *Floridina minima*, new species. (p. 57.)

The incrusting zoarium, × 20, showing both the ancestrular and marginal areas.

Miocene (Duplin marl): Natural Well, 2 miles northwest of Magnolia, North Carolina.

FIGS. 7, 8. *Floridina regularis*, new species. (p. 57.)

7. The external layer of the lamellar incrusting zoarium, × 20.

Miocene (Duplin marl): Wilmington, North Carolina.

8. A variety of this species, × 20, distinguished by its slightly smaller zooecia.

Miocene (Duplin marl): Natural Well, 2 miles southwest of Magnolia, Duplin County, North Carolina.

FIG. 9. *Hemiseptella fistula* Ulrich and Bassler, 1904. (p. 73.)

The original type, × 20, showing the spicules on the inferior border.

Miocene (St. Mary's formation): St. Marys River, Maryland.

FIG. 10. *Hemiseptella? lacinia* Tuomey and Holmes, 1857. (p. 70.)

The original figure of this doubtful species which has not been rediscovered.

Miocene: Smith's, Goose Creek, South Carolina.

FIG. 11. *Hemiseptella rectangulata*, new species. (p. 74.)

Photograph of the incrusting zoarium, × 20, showing the rectangular form of the zooecia, the minute spinose processes, and the absence of dietellae.

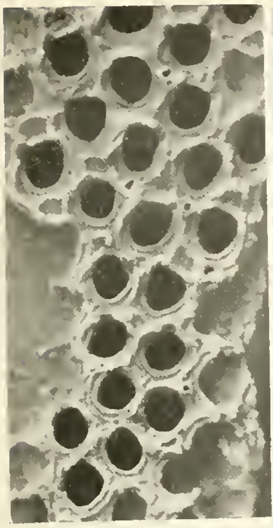
Miocene (Duplin marl): Wilmington, North Carolina.

FIGS. 12, 13. *Steganoporella magnilabris* Busk, 1854. (p. 63.)

12. Surface of a zoarium, × 20, showing the polypidian tube and the opesiules.

13. An example, × 20, with both small (a) and large (B) zooecia, and illustrating clearly the large lip under which is a polypidian tube.

Pliocene (Caloosahatchee marl): Monroe County, Florida.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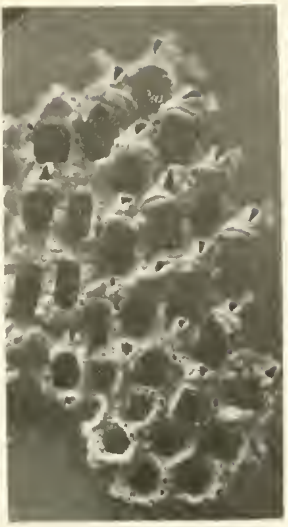
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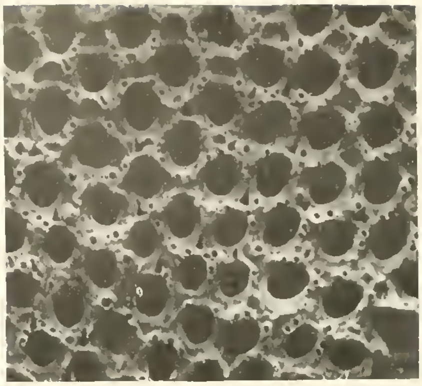
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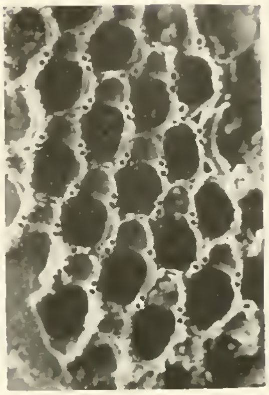
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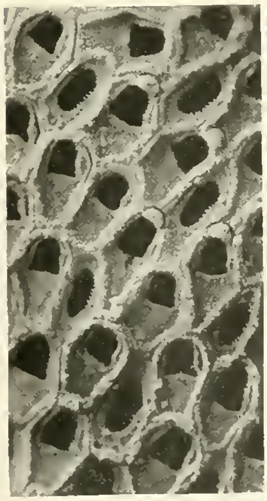
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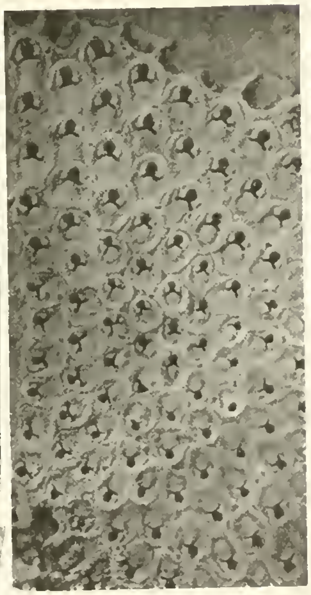
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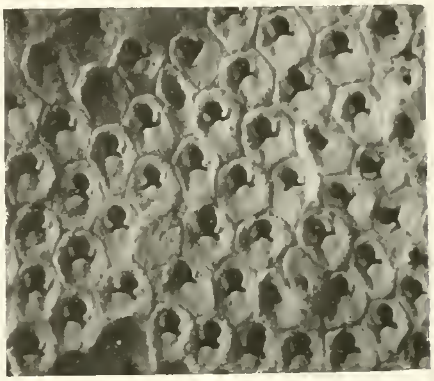
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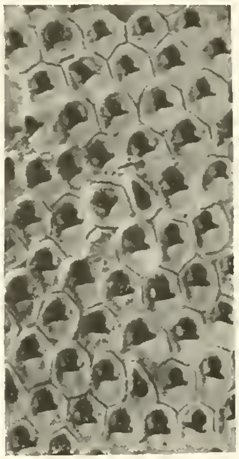
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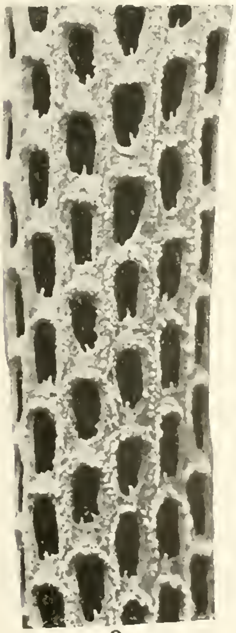
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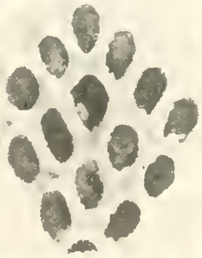
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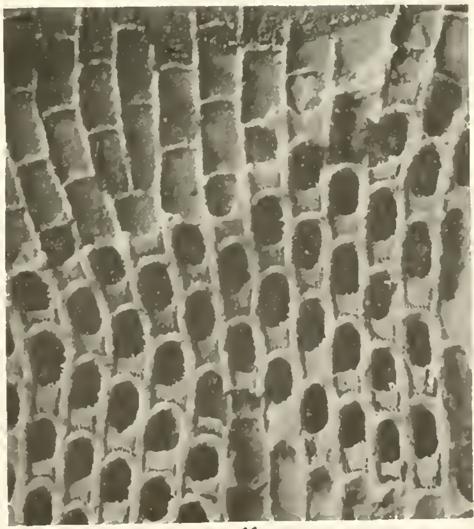
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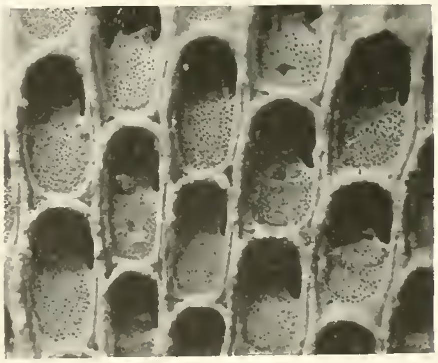
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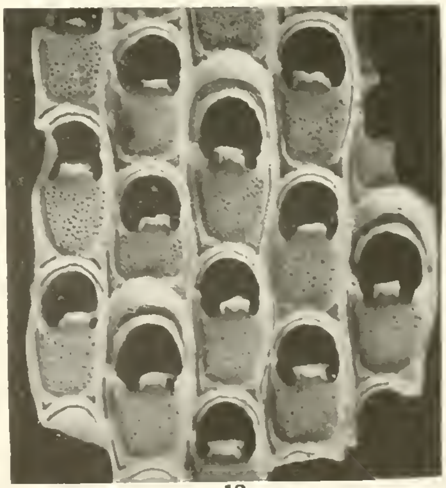
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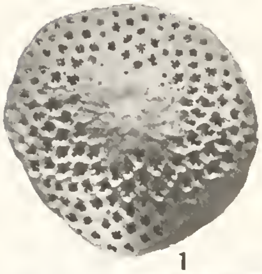
NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 258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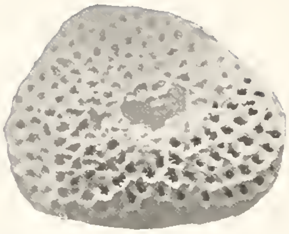
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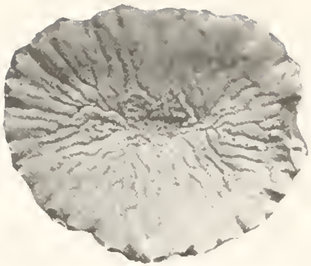
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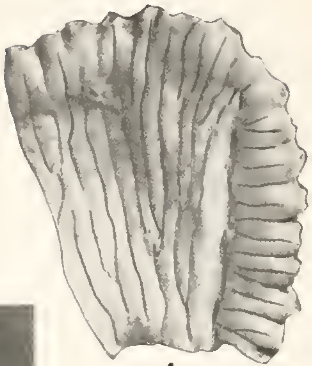
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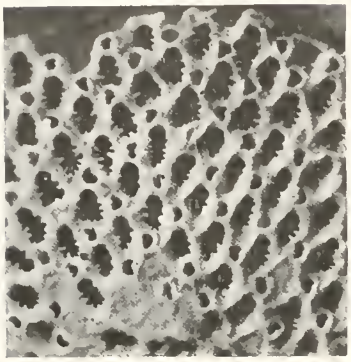
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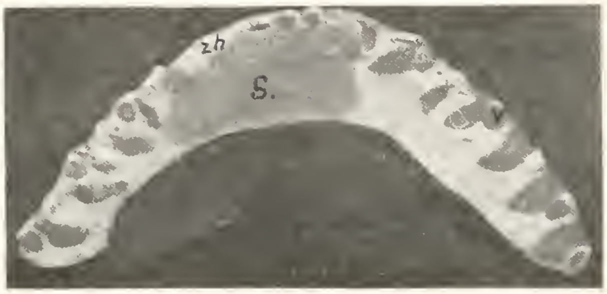

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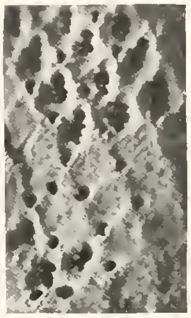
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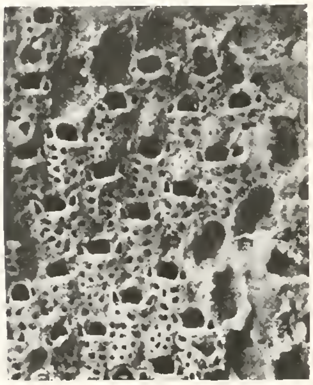
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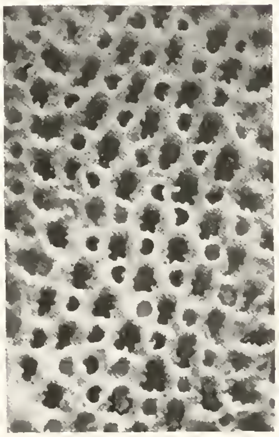
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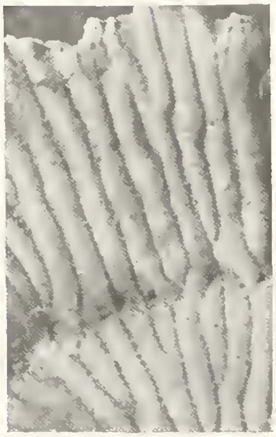
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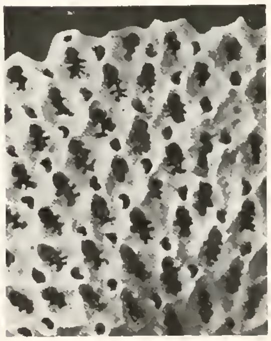
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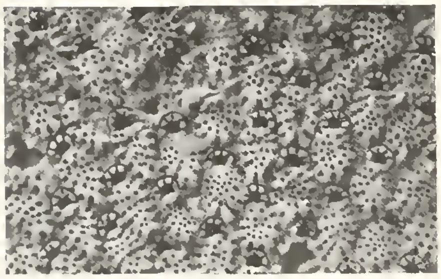
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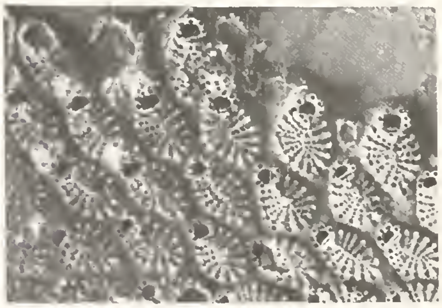
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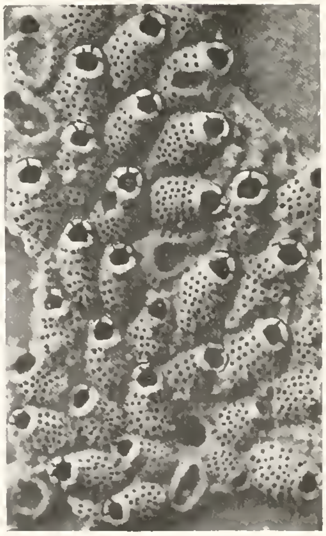
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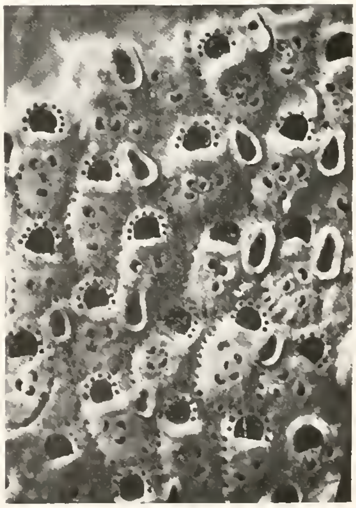
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 259.

PLATE 15.

FIGS. 1–5. *Cupularia doma* D'Orbigny, 1851. (See also plate 1, fig. 18.) (p. 77.)

1. A zoarium, × 10, showing the ancestrular zooecia covering the substratum. These zooecia are calcified and deprived of polypide.

2. Another zoarium × 10, illustrating that the ancestrular zooecia are easily detached in fossilization.

3. Inner side of zoarium, × 10, which is smooth or slightly granulated.

4. Inner (superior) side of a zoarium with hydrostatic zooecia, × 20. The ribs are smoooth and are not radially arranged. This difference in arrangement depends on the form of the substratum on which the larva fixes itself.

5. Celluliferous face × 20, illustrating the form of the denticles.

Miocene (Duplin marl): Wilmington, North Carolina.

FIGS. 6–10. *Cupularia denticulata* Conrad, 1841. (p. 79.)

6. Calcified ancestrular zooecia × 20. The vibracula alone are visible.

7. Center of a zoarium × 20, deprived of calcified zooecia.

8. Inner side of a large zoarium × 20, without hydrostatic zooecia, showing the regular bifurcation of each rib.

9. Zooecia × 20, illustrating the two symmetrical condyles and the vestibular arch above, the auriculated vibracula and the irregular denticles below.

10. A median section through a zoarium × 25, showing the substratum (*s*) upon which the larva became attached, the calcified hydrostatic zooecia (*zh*) covering the substratum and the ordinary zooecia surmounted by their vibracula (*v*).

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

FIG. 11. *Cribrilina punctata* Hassall, 1841. (p. 87.)

The type specimen of *Lepralia marylandica* Ulrich and Bassler, 1904, × 20, showing its identity with this widespread fossil and recent species.

Miocene (St. Mary's formation): Cove Point, Maryland.

FIG. 12. *Puellina radiata* forma *scripta* Reuss, 1847. (See also pl. 35, fig. 1.) (p. 89.)

A well-preserved example, × 20 with wide zooecia, somewhat approaching forma *rarecosta*, Reuss, 1847.

Miocene (Yorktown formation): 1 mile west of Fort Nonsense, Gloucester County, Virginia.

FIG. 13. *Puellina innominata* Couch, 1844. (p. 90.)

A Miocene example of this widespread species, × 20.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

FIG. 14. *Cribrilina ligulata*, new species. (p. 88.)

The type specimen, × 25, showing the ancestrula and surrounding zooecia. The spines of the peristome are transformed by coalescence into several small tongues.

Miocene (Calvert formation): 1 mile south of Parkers Creek, Calvert County, Maryland.

FIG. 15. *Cribrilina cuspidata*, new species. (p. 88.)

The incrusting type specimen, × 20 showing the line of small lacunae, the few large lacunae and the very large triangular avicularia with rounded beak.

Miocene: Santiago, Cuba.

PLATE 16.

FIG. 1. *Trypostega venusta* Norman, 1864 (p. 95.)

A Miocene example of this widely distributed species. × 20.

Miocene (Duplin marl): Wilmington, North Carolina

FIG. 2. *Lacerna mucronata* Smitt, 1872. (p. 99.)

A fossil, incrusting example × 20, referred to this recent species.

Miocene (Duplin marl): Wilmington, North Carolina.

FIG. 3. *Arthropoma cornuta*, new species. (p. 97.)

The incrusting zoarium, × 20, showing the characteristic sinus and the frontal protuberance.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

FIGS. 4-9. *Stephanosella biaperta* Michelin, 1842. (p. 99.)

4. The incrusting zoarium, × 20, illustrating the triangular avicularia.

5. A zoarium, × 20, with more rounded avicularia. The tremocyst is detachable from the subjacent olocyst.

6. Interior of the zooecia × 20, illustrating the form of the apertura.

Pleistocene: Rustic Canyon, Santa Monica, California.

7. An example, × 20, containing both round and triangular avicularia.

Pleistocene: Los Angeles, California.

8. Surface, × 20, showing several ovicelled zooecia.

Pleistocene: Vero, Florida.

9. A zoarium × 20 showing the ancestrular zooecia and the thinness of the zooecial walls. The dietellae are very narrow.

Pleistocene: Dead Man's Island off San Pedro, California.

FIG. 10. *Schizoporella cumulata* Ulrich and Bassler, 1904. (p. 96.)

View of the type specimen, × 20, showing the irregular arrangement and the piling up of the zooecia.

Miocene (Choptank formation): Jones Wharf, Maryland.

FIGS. 11-15. *Schizopodrella floridina* Osburn, 1914. (p. 106.)

11. A zoarium, natural size, composed of many lamellae.

12. Non oriented ancestrular zooecia, × 20.

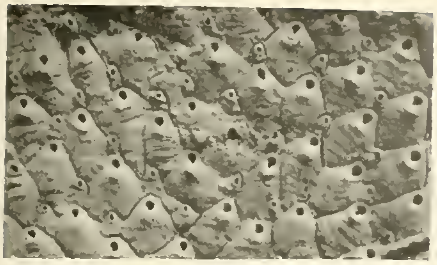
13. Normal aspect of the zooecia, × 20. One zooecium has been regenerated with an avicularium occupying the apertura.

14. A transverse section through a multilamellar zoarium, × 20.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

15. Zooecia × 20, showing the form of the apertura more clearly. Several of the apertures are closed.

Miocene (Duplin marl): Wilmington, North Carolina.



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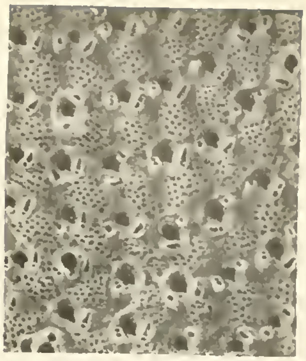

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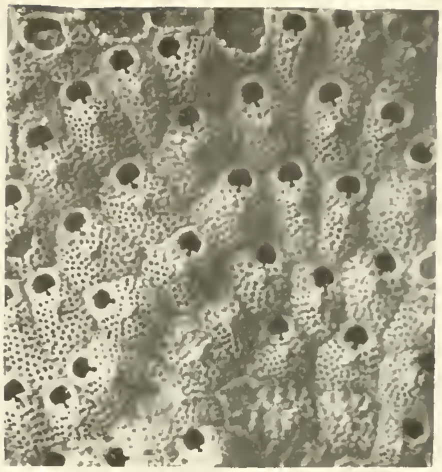

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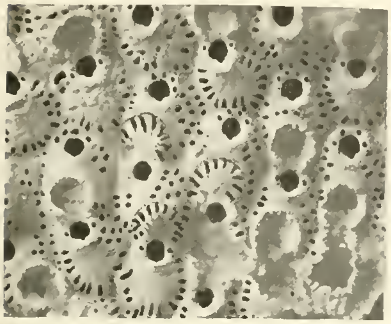

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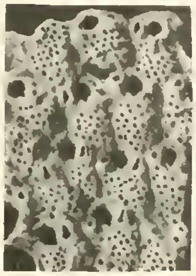

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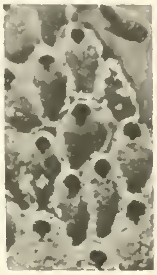

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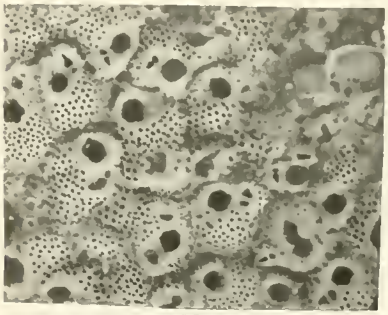

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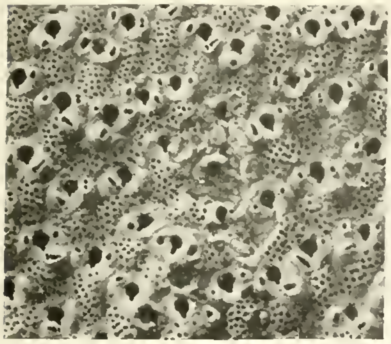

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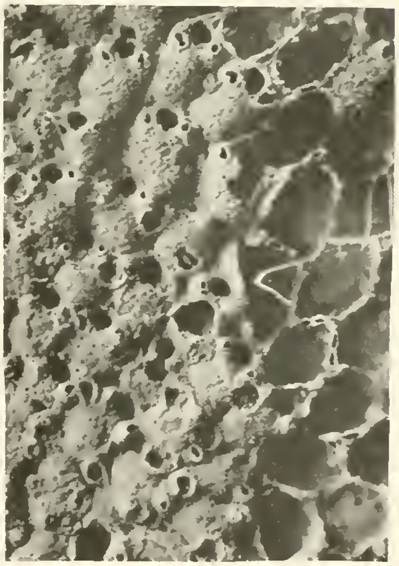

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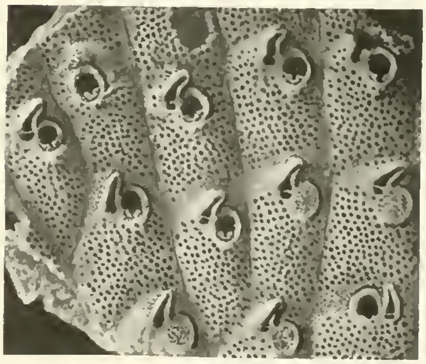

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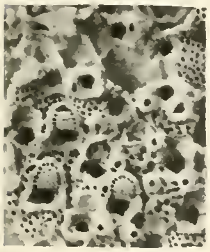

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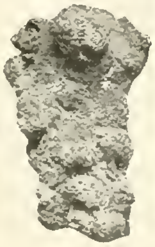

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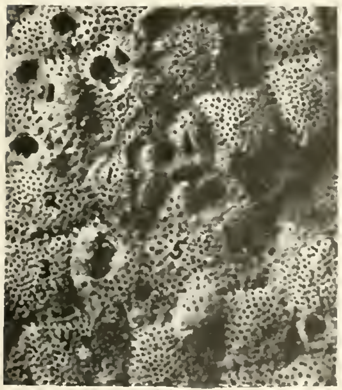

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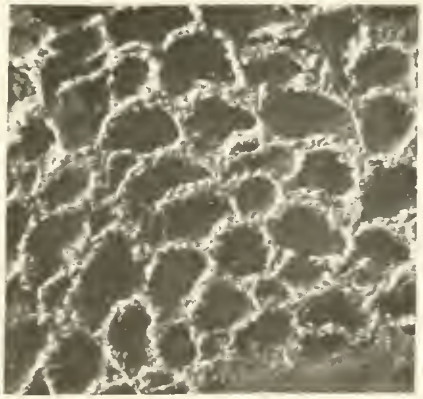

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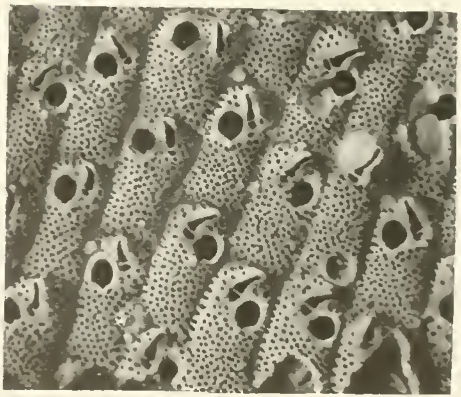

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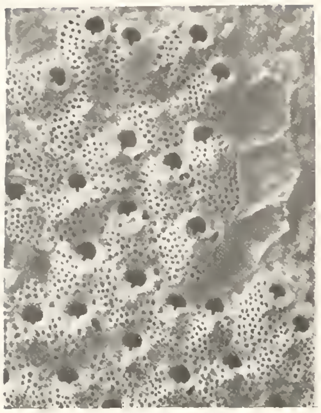
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 260.



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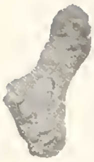

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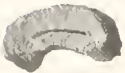

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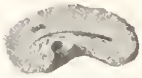

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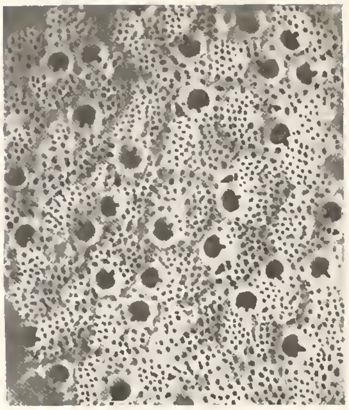

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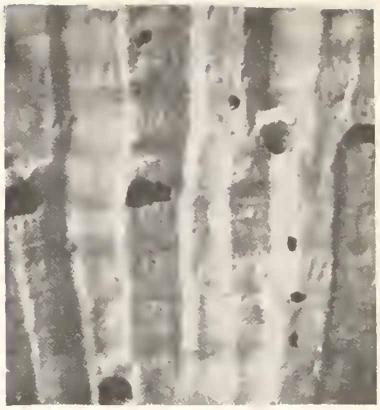

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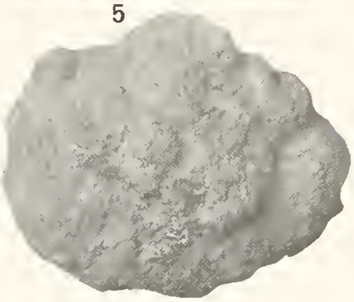

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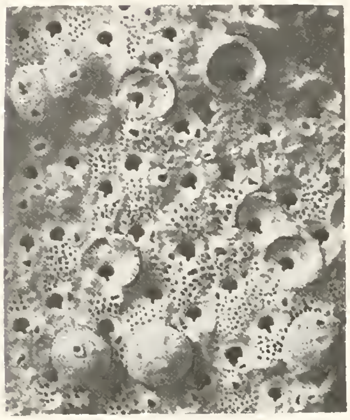

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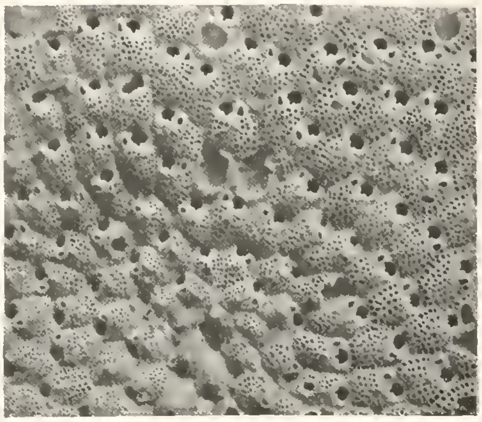

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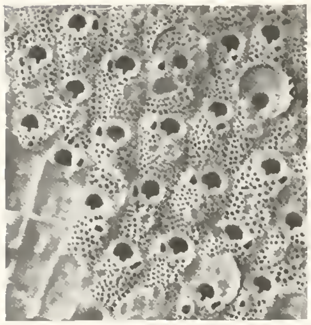

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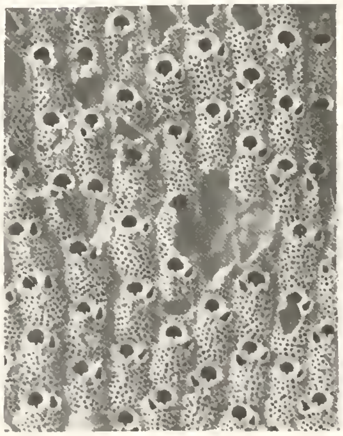

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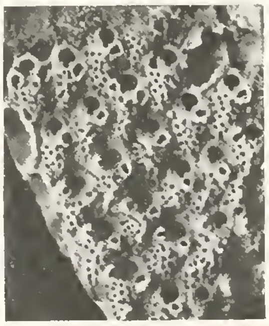

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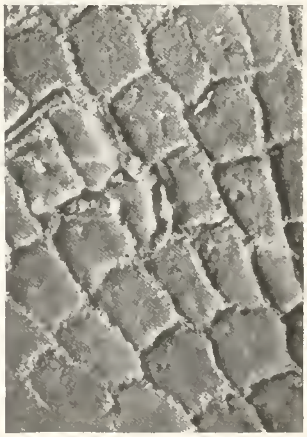

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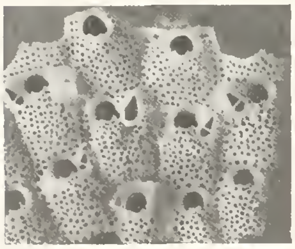

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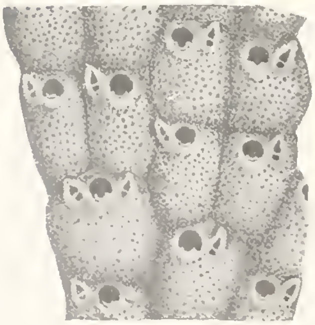

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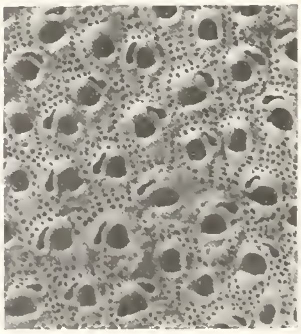

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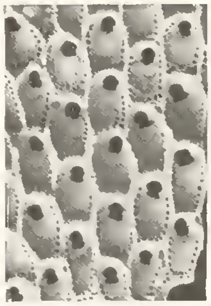

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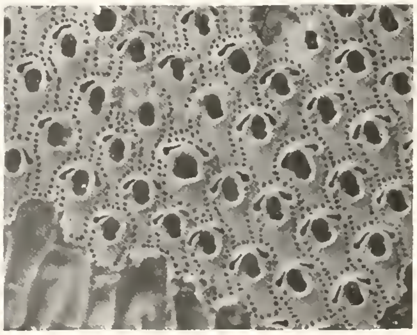

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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 261.

PLATE 17.

FIGS. 1–12. *Stylopoma spongites* Pallas, 1766. (p. 102.)

1, 2. Two forms of the zoarium, natural size, made up of many lamellae.

3, 4. Transverse sections of zoaria, natural size.

5. Surface × 20, showing broad unovicelled zooecia.

6. Another surface × 20, exhibiting nonoriented zooecia which bear conspicuous avicularia.

7. Inferior face of a lamella, × 20.

Miocene (Duplin marl): Wilmington, North Carolina.

8. Normal zooecia with avicularia × 20. Dietellae are not present. The broken ovicell shows the tremocyst resting on the olocyst.

9. Normal and ovicelled zooecia × 20. The ovicell surrounds and conceals the apertura.

10. Ancestrular portion of a zoarium, × 20.

11. Zooecial walls × 20, obtained by abrasion of the surface, showing arrangement of the septules.

12. A portion of a zoarium × 20, with quite elongated zooecia.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.

FIGS. 13, 14. *Schizopodrella unicornis* Johnston, 1847. (p. 105.)

13. Photograph of a well-preserved Miocene specimen, × 20, showing the form of the apertura and the avicularia clearly.

14. Zooecia of the type specimen of *Schizoporella subquadrata* Ulrich and Bassler, 1904, now considered as a synonym of *S. unicornis*.

Miocene (Choptank formation): Governor Run, Maryland.

FIGS. 15–17. *Hippaliosina rostrigera* Smitt, 1872. (p. 167.)

15. Zooecia, × 20, of a form exhibiting only one avicularium above the aperture.

Miocene (Duplin marl): 1 mile northeast Suffolk, Virginia.

16. The normal form of the species, × 20, with two avicularia.

17. Interior of zooecia, × 20, illustrating the two cardelles and the olocyst.

Pliocene (Caloosahatchee marl): Monroe County, Florida.

FIGS. 18–19. *Schizopodrella pusilla*, new species. (p. 106.)

18. The free bilamellar zoarium, natural size.

19. Surface, × 20, showing the small zooecia with large tremopores.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

PLATE 18.

FIGS. 1–3. *Schizoporella doverensis* Ulrich and Bassler, 1904. (p. 107.)

1. A Pliocene example, × 20, referred to this species.

2. Ancestrular portion of a zoarium, × 20, showing irregular arrangement of zooecia.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.

3. The incrusting type of the species, × 20.

Miocene (Choptank formation): Dover Bridge, Maryland.

FIG. 4. *Schizoporella latisinuata* Ulrich and Bassler, 1904. (p. 95.)

Photograph of the original incrusting type, × 20.

Miocene (Choptank formation): Jones Wharf, Maryland.

FIGS. 5, 6. *Gemelliporella asper*, new species. (p. 110).

5. The incrusting zoarium, × 20, with oriented zooecia and showing both the large and small avicularia.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

6. A Pliocene example, ×20, illustrating nonoriented zooecia, several of which preserve the ovicell.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

FIGS. 7–9. *Hippoporina* (?) *vestita*, new species. (p. 130.)

7. View of the incrusting zoarium, × 20, with the zooecia more distinctly marked than usual.

8. An example, × 20, showing at the base the calcareous pellicle covering the frontal and at the top, monstrous zooecia. All of the zooecia have indistinct outlines.

9. An example, × 20, preserving some ovicelled zooecia.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahasse, Florida.

FIG. 10. *Hippoporina gibbosa*, new species. (p. 130.)

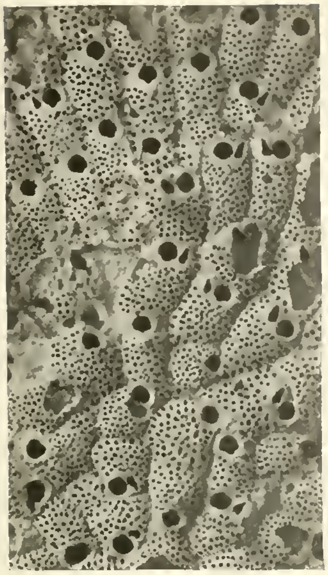
The incrusting type specimen, × 20, showing the smooth frontal with its gibbosity, the shape of the aperture and the widely open ovicell.

Miocene (Duplin marl): Wilmington, North Carolina.

FIG. 11. *Lepralia montifera* Ulrich and Bassler, 1904. (p. 134.)

Photograph of the original type, × 20.

Miocene (St. Mary's formation): St. Marys River, Maryland.



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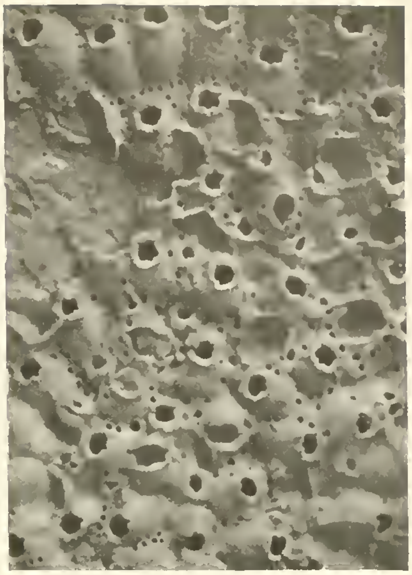

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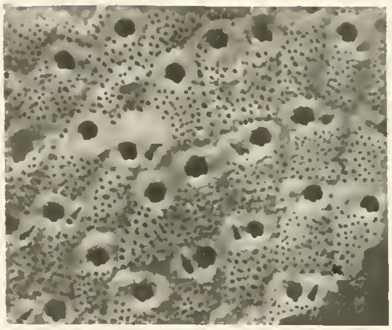

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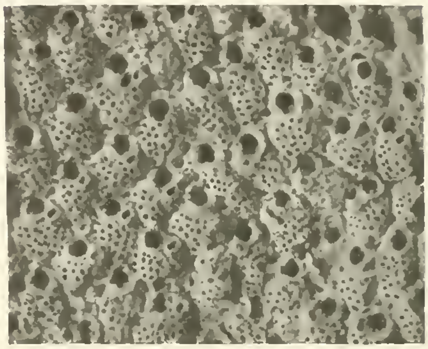

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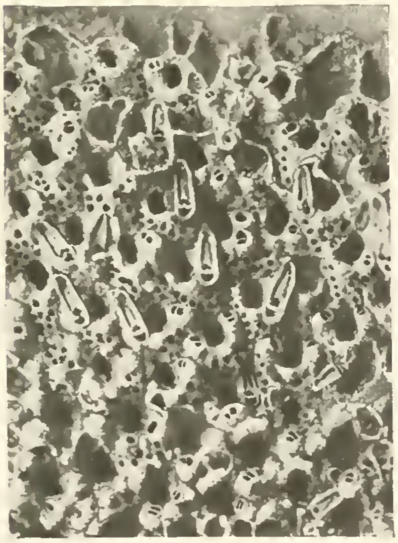

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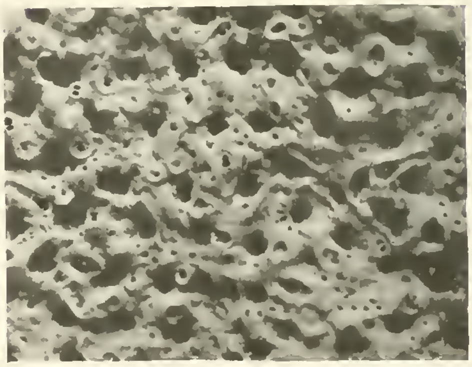

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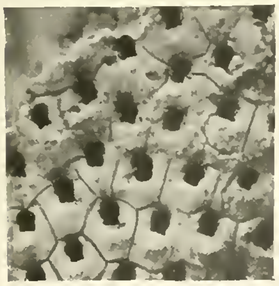

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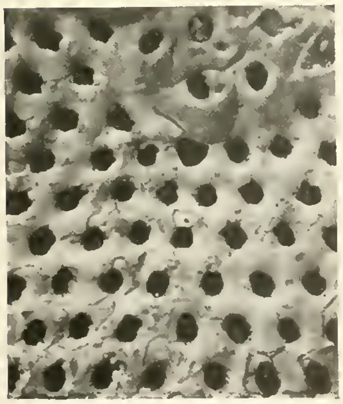

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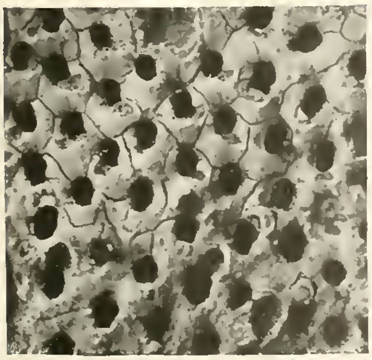

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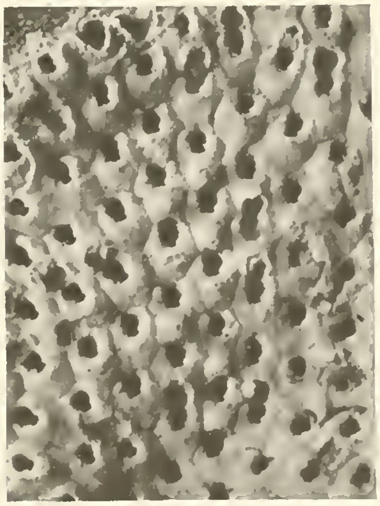

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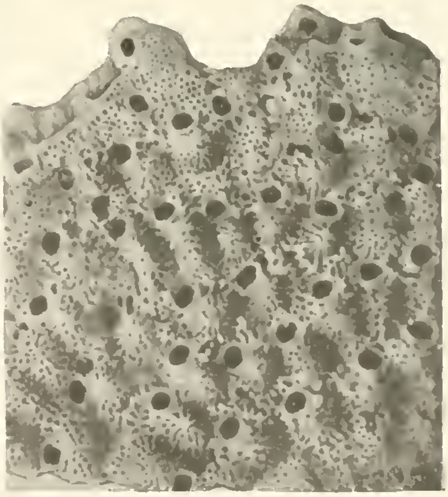

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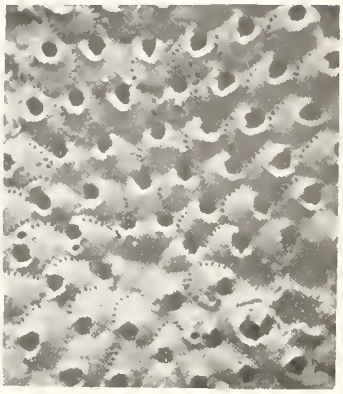
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 262.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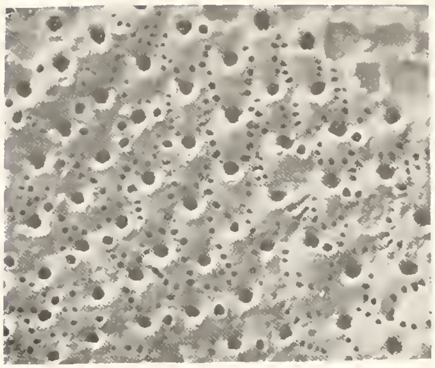
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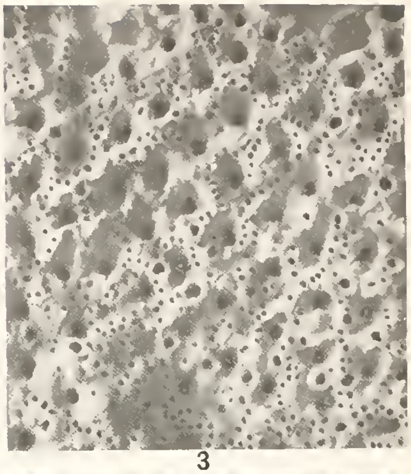
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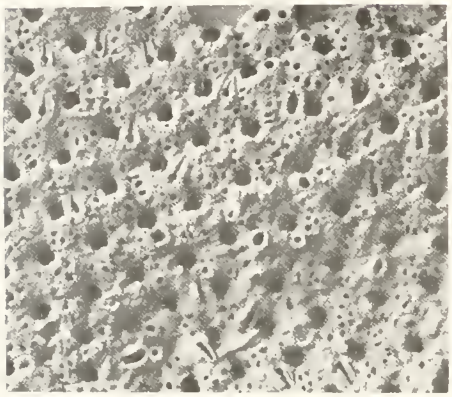
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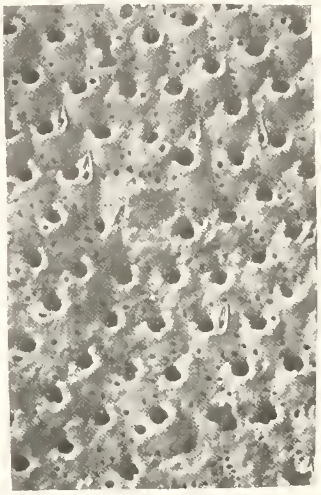
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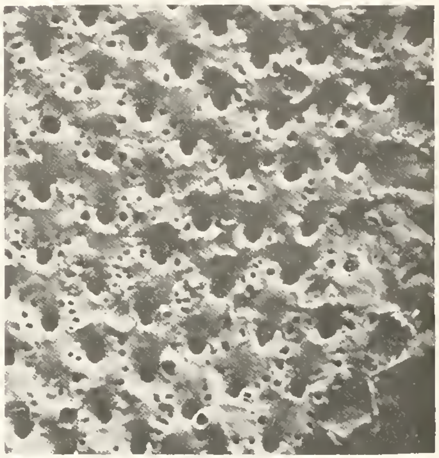
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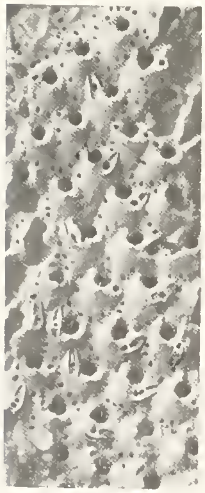
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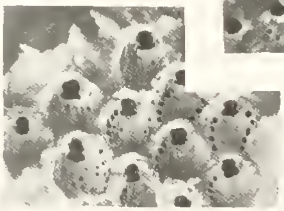
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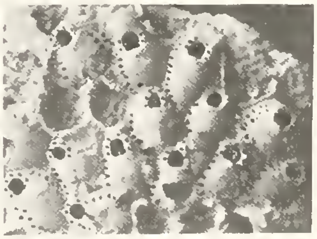
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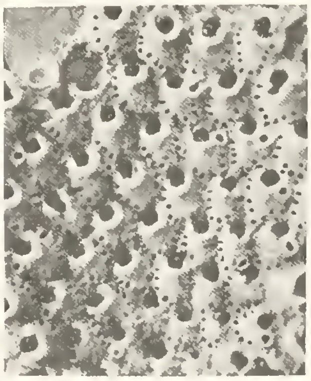
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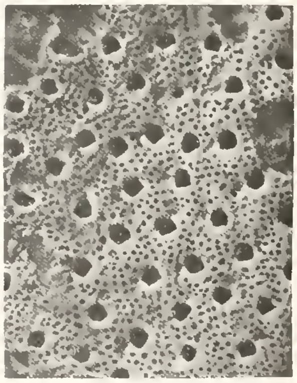
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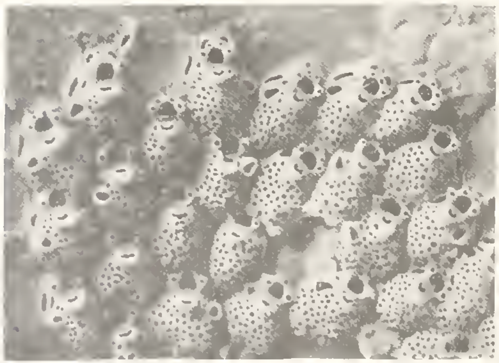
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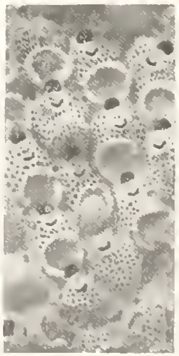
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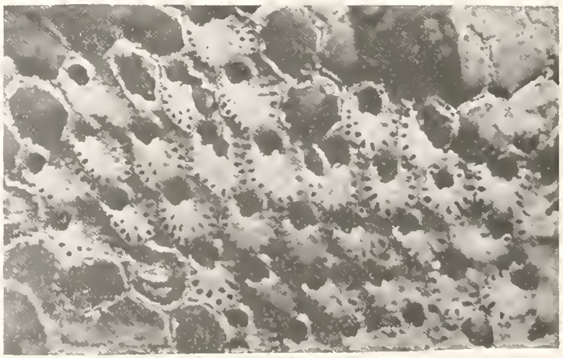
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 263.

PLATE 19

FIGS. 1–9. *Gemelliporella vorax*, new species. (p. 111.)

1. Ancestrular portion of the incrusting zoarium × 20. The ancestrula is covered by the pleurocyst of the adjacent zooecia.

2. Zooecia, × 20, with orbicular avicularia. The areolar pores and granular pleurocyst are evident.

3. A zoarium, × 20, with indistinct zooecia and orbicular avicularia.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

4. Zooecia, × 20, with large spatulate avicularia. The areolae are limited by short costules.

5. Zooecia, × 20, with large areolar pores and the granulated pleurocyst shown.

6. Portion of a large zoarium, × 20, with indistinct zooecia and orbicular avicularia.

7. Interior of the zooecia, × 20, showing the olocyst which supports the pleurocyst.

Miocene (Duplin marl): Wilmington, North Carolina.

8. Zooecia, × 20, with both large and small avicularia.

Pliocene (Caloosahatchee marl): Monroe County, Florida.

9. A zooecia of a young zoarium, × 20, with large spatulate avicularia.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.

FIG. 10. *Hippoporella spinosa*, new species. (p. 132.)

The incrusting type specimen × 20, showing the smooth frontal with small lateral areolar pores and the spines of the peristome.

Miocene (Yorktown formation): Yorktown, Virginia.

FIG. 11. *Cyclicopora? mansfieldi*, new species. (p. 138.)

Unovicelled zooecia of the incrusting zoarium, × 20, showing the suborbicular aperture and the numerous large tremopores.

Miocene (Yorktown formation): 1½ miles southwest of Reeds Ferry, Virginia.

FIGS. 12, 13. *Microporella fissurifera*, new species. (p. 121.)

12. Unovicelled zooecia of the incrusting zoarium × 20, exhibiting the dietellae visible along the edge of the zooecia.

Miocene (Yorktown formation): Near Macedonia Church, Essex County, Virginia.

13. Ovicelled zooecia, × 20.

Miocene (Duplin marl): 10 miles south of Greenville, North Carolina.

FIG. 14. *Hippoporella papulifera*, new species. (p. 133.)

Unovicelled zooecia of the incrusting zoarium, × 20, with distinct areolar pores and the characteristic mucro.

Miocene (Choctawhatchee marl). Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

PLATE 20.

FIGS. 1-6. *Microporella ciliata* Linnaeus, 1759. (See also pl. 36, figs. 4, 5.) (p. 119.)

1. Incrusting portion of zoarium, × 20, showing the typical zooecia.

2. Bilamellar expansion of the same zoarium, × 20. The zooecia have large tremopores and no granules.

Miocene: Kuhns, Carteret County, North Carolina.

3. Typical zooecia, × 20, with their frontal provided with granules and small tremopores.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

4. The original type specimen of *Microporella praeciliata* Ulrich and Bassler, 1904, × 28, hitherto distinguished on account of its large tremopores.

5. Several zooecia of the same, further enlarged.

Miocene (Choptank formation): Jones Wharf, Maryland.

6. The type specimen of *Microporella inflata* Ulrich and Bassler, 1904, now considered a synonym of *M. ciliata*.

Miocene (Choptank formation): Jones Wharf, Maryland.

FIGS. 7-11. *Microporella bifoliata* Ulrich and Bassler, 1904. (p. 121.)

7. Photograph of the bifoliate type specimen, × 20, with both ovicelled and unovicelled zooecia.

8. A drawing of two ovicelled zooecia.

9. A zooecium and an avicularium highly magnified.

10. Mature unovicelled zooecia, × 20.

11. Unovicelled zooecia, × 20, illustrating appearance in young specimen.

Miocene (Choptank formation): Cordova, Maryland.

FIGS. 12, 13. *Cyclocolposa* (?) *spinifera* new species. (p. 136.)

12. The incrusting zoarium, × 20, with ancestrular zooecia. The pleurocyst is incompletely developed.

13. A zoarium with mature zooecia, × 20, showing the very thick frontal and the globular smooth ovicell.

Miocene (Yorktown formation): 1 mile west of Fort Nonsense, Gloucester County, Virginia.

FIGS. 14, 15. *Microporella hexagona*, new species. (p. 120.)

14. The incrusting zoarium, × 20, showing the strongly calcified hexagonal zooecia.

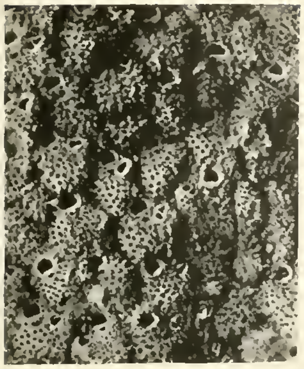
15. Another portion of the same specimen, × 20, illustrating the hexagonal shape of the zooecia, the large ascopore with its salient peristome and the triangular avicularia.

Miocene (Duplin marl): Darlington Courthouse, South Carolina.

FIG. 16. *Dakaria grandis*, new species. (p. 97.)

The incrusting zoarium, × 20.

Miocene (Yorktown formation): Yorktown, Virginia.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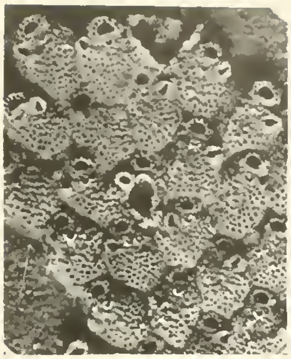
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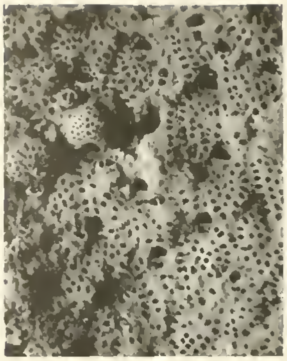
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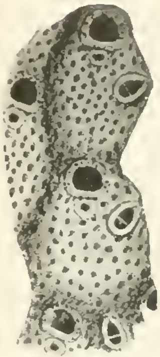
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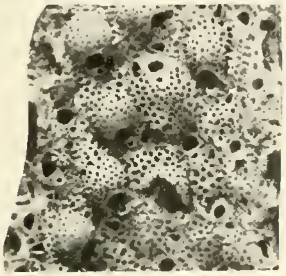
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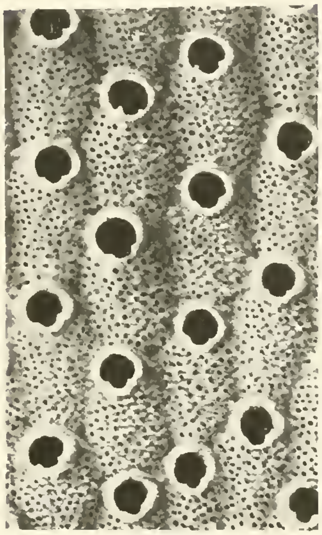
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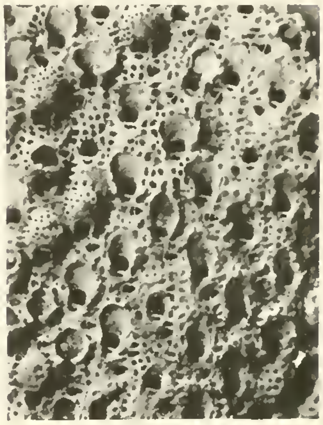
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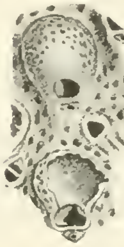
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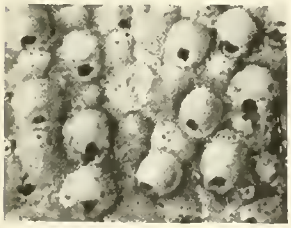
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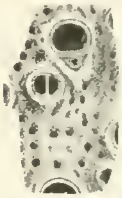
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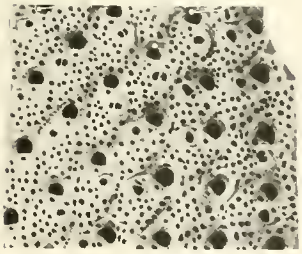
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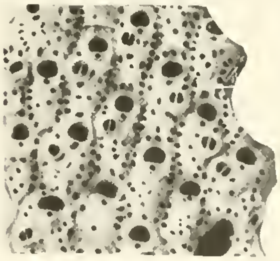
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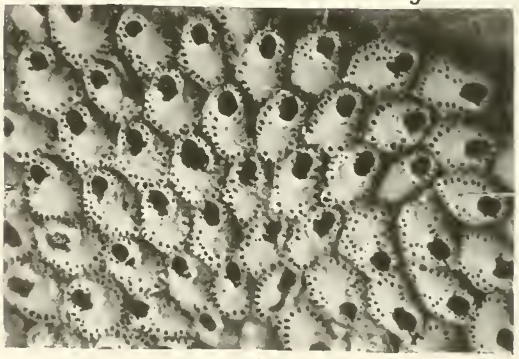
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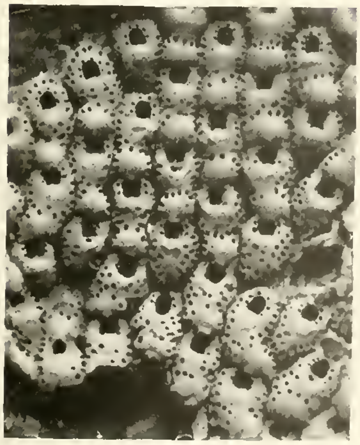
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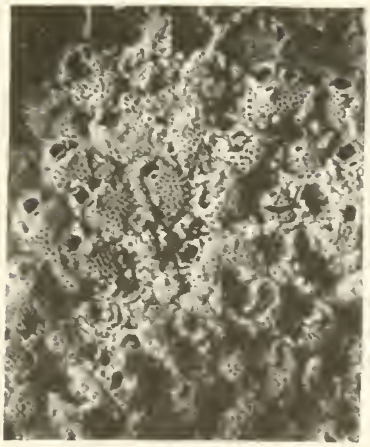
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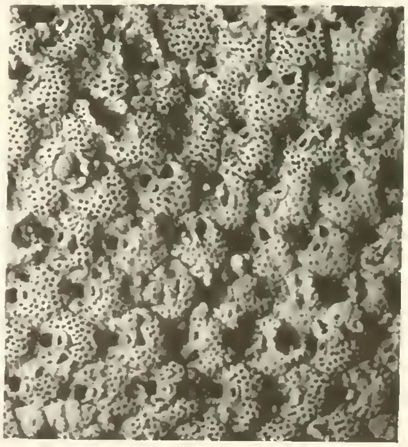
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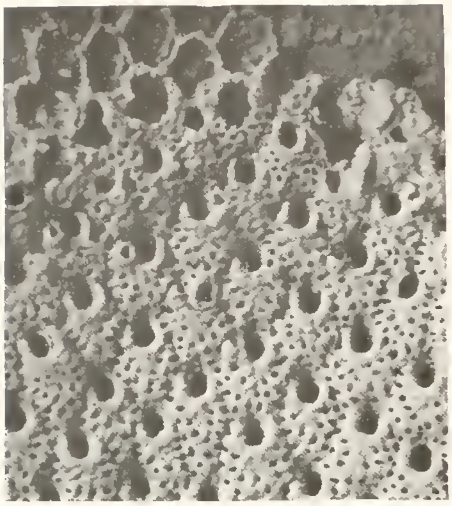
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 264.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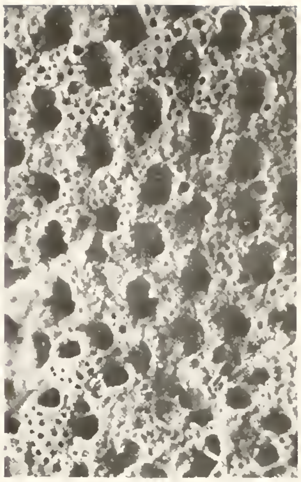
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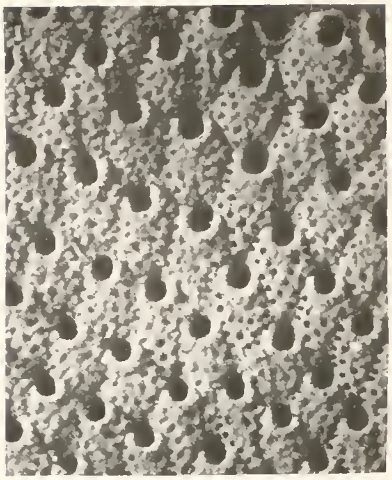
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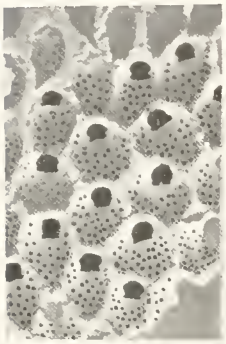
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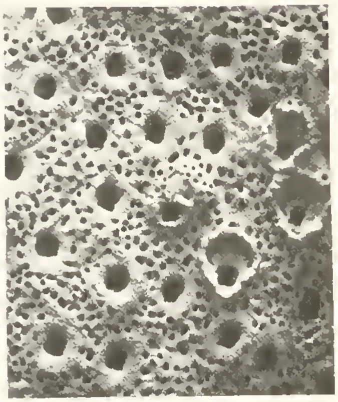
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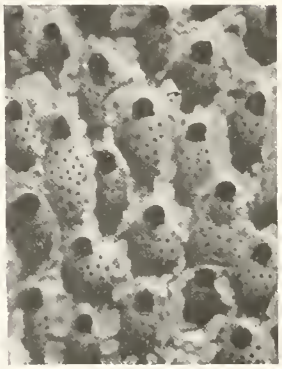
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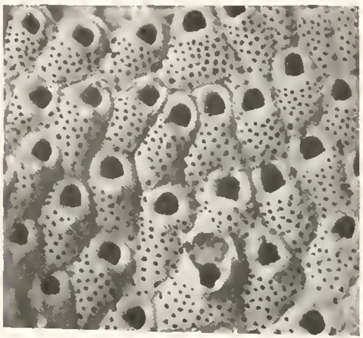
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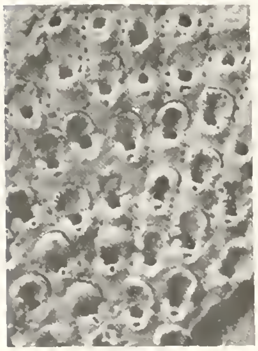
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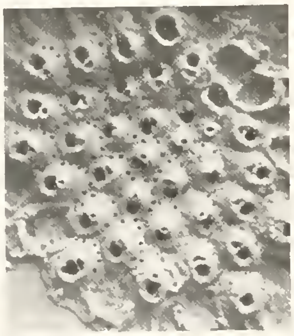
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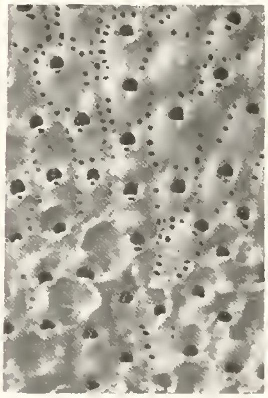
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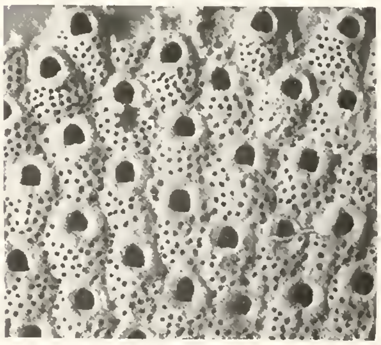
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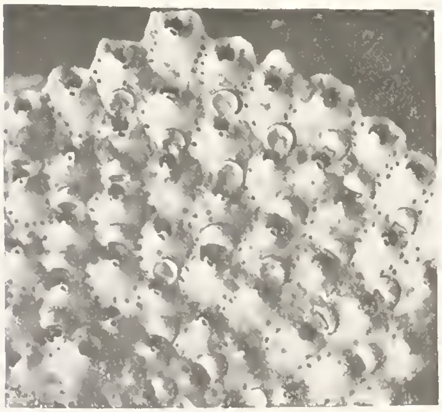
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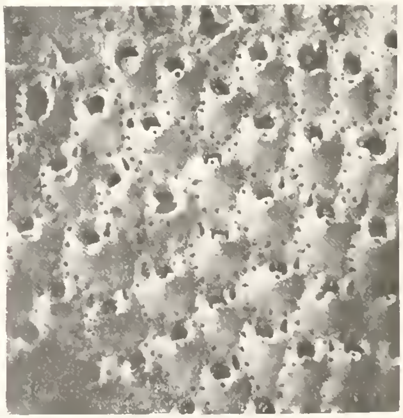
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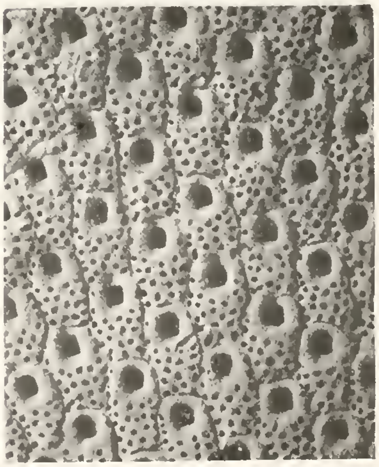
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 265.

PLATE 21.

FIGS. 1–4. *Cyclocolposa tenuiparietis*, new species. (p. 136.)

1. The incrusting zoarium, × 20, with some of the zooecia bearing a round avicularium. The thinness of the zooecial walls may be noted.

2. Ovicelled zooecia, × 20, showing the ovicell deeply imbedded in the distal zooecium.

3. Zooecia, × 20, exhibiting regular arrangement, the two rows of areolae and the granulated pleurocyst.

4. Interior of the zooecia, × 20, illustrating the condyles on each side of the apertura.

Miocene (Duplin marl): Harvey's Mills, Leon County, Florida.

FIGS. 5–9. *Cycloperiella rubra*, new species. (p. 137.)

5. Surface of an incrusting lamella, × 20, with several ovicelled zooecia, showing that the ovicell entirely covers the apertura.

6. Normal zooecia, × 20.

7. Interior of the zooecia, × 20, illustrating the two lateral condyles on which the operculum oscillates.

Miocene (Duplin marl): Wilmington, North Carolina.

8. Zooecia, × 20, preserving a frontal gibbosity.

Miocene (Duplin marl): 8 miles east of Snow Hill, North Carolina.

9. A Pliocene example of this species, × 20; the zooecia are slightly less regular than in the Miocene form.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

FIGS. 10–14. *Aimulosia aculeata*, new species. (p. 139.)

10. The incrusting zoarium with ovicelled zooecia, × 20.

Miocene (Duplin marl): Harvey's Mills, Leon County, Florida.

11. The ancestrula and surrounding zooecia, × 20. The first zooecium is an avicularium while the other four zooecia are normal.

Miocene (Duplin marl): Muldrow's Mills, South Carolina.

12. A very irregular incrusting zoarium, × 20.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

13. Zoarium with ovicelled zooecia, × 20. The orifice of the ovicell is distinct from the apertura.

14. Broad marginal zooecia, × 20, without ovicell.

Miocene (Duplin marl): Wilmington, North Carolina.

PLATE 22.

FIGS. 1–6. *Leiosella edax*, new species. (p. 142.)

1. Fragments of the free unilamellar zoarium, natural size.

2. A tubular zoarium, × 20, with the zooecia exhibiting the large rimule spiramen.

3. Ovicelled zooecia, × 20.

4. Zooecia, × 20, in which the small frontal avicularia are replaced by a large avicularium with spatulate mandibles.

5. A tubular zoarium, × 20, showing zooecia provided with an irregular rimule spiramen and with small avicularia.

6. Interior of zooecia, × 20, showing the apertura and the peristomial avicularium.

Lower Miocene (Chipola marl): Chipola River, Calhoun County, Florida.

FIGS. 7–14. *Smittina trispinosa* Johnston, 1838. (p. 143.)

7. Unovicelled zooecia of a well preserved zoarium, × 20, with the avicularium small or absent

8. Ancestrula and surrounding zooecia of the same zoarium, × 20.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

9. Ancestrula region of a Miocene example, × 20.

Miocene (Duplin marl): Wilmington, North Carolina.

10. An abraded surface, × 20, showing the alternate arrangement of the zooecia between two rectilinear axes without septulae.

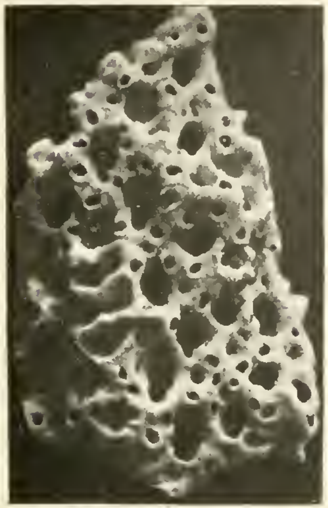
11. An ovicelled zoarium, × 20, in which the ovicells are broken. The alternate arrangement of the zooecia is visible.

12. Zooecia, × 20, with salient avicularia.

13. Zooecia, × 20, in which the peristome is formed by two lateral salient lips.

14. Zooecia, × 20, with well-preserved ovicells.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.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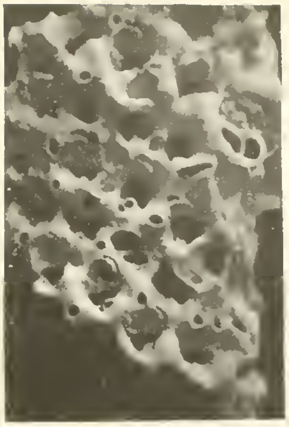
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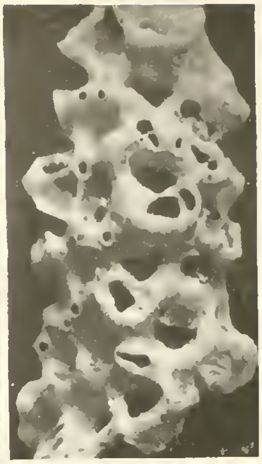
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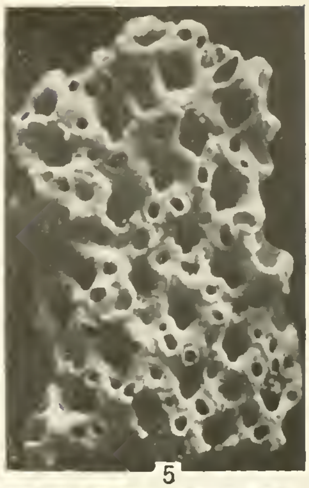
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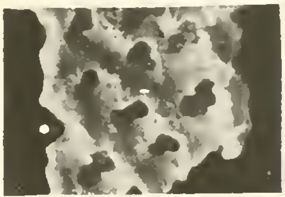
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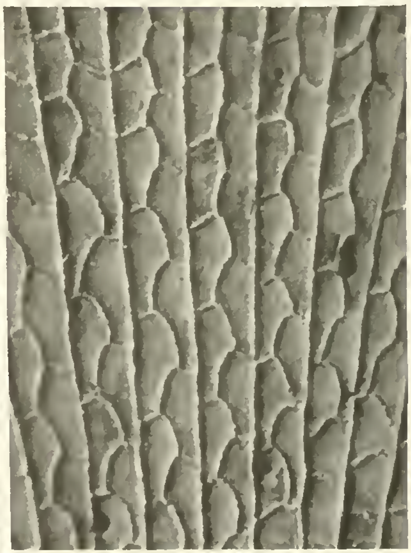
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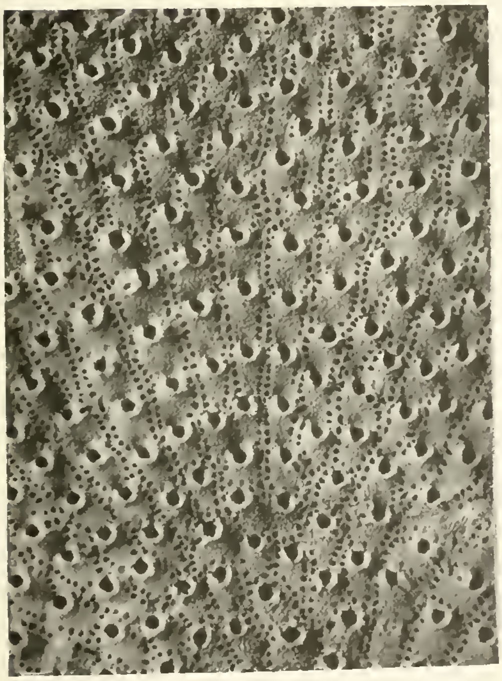
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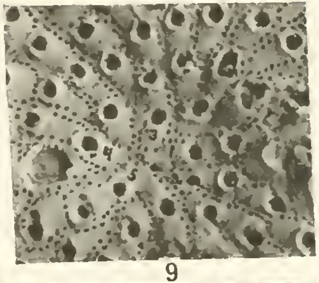
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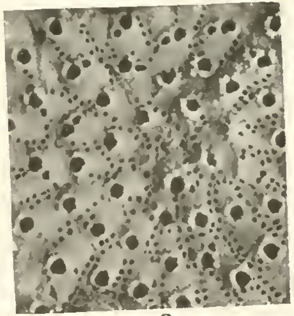
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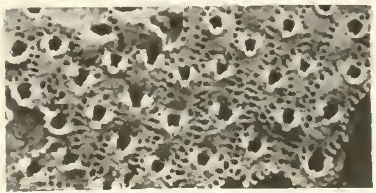
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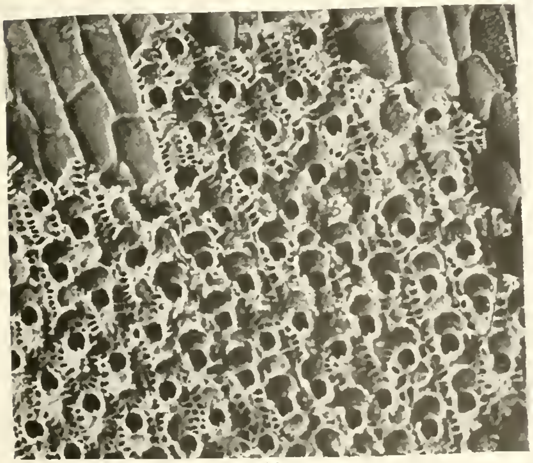
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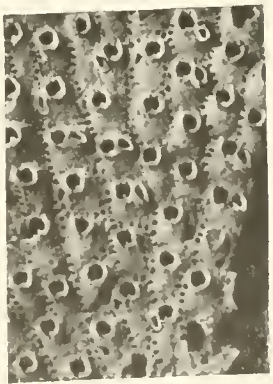
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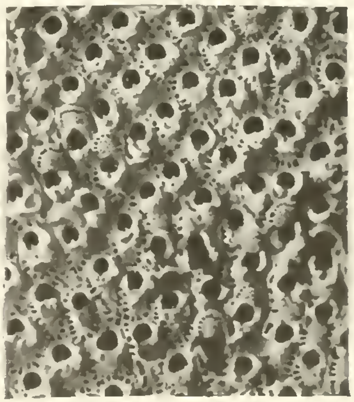
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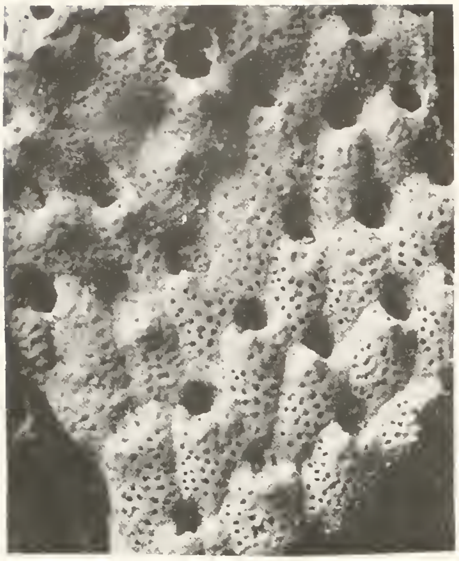
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 266.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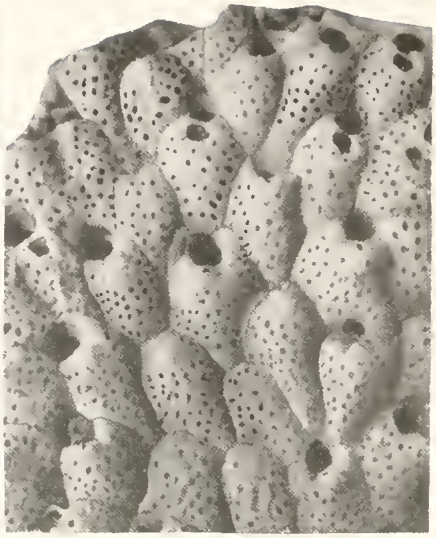
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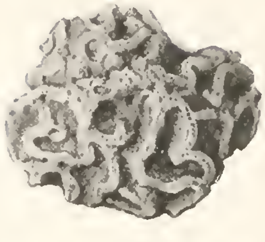
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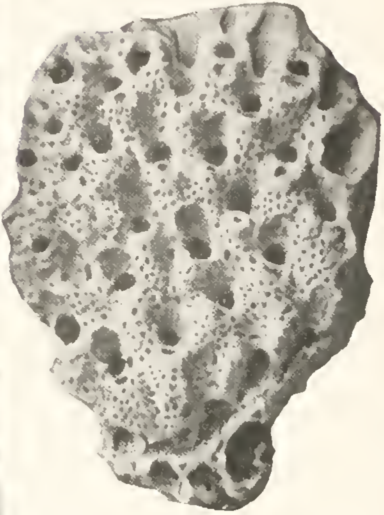
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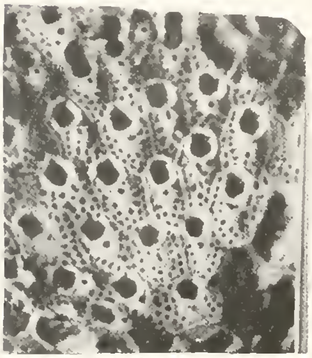
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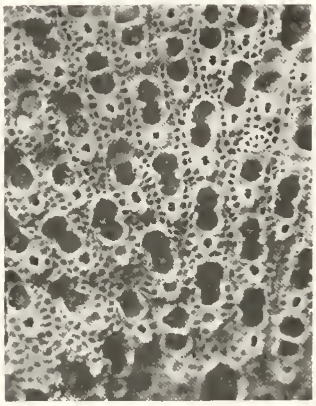
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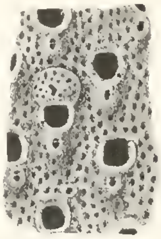
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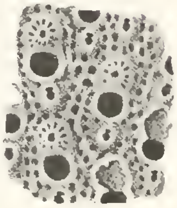
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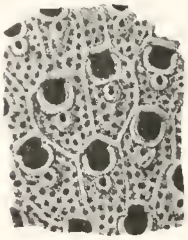
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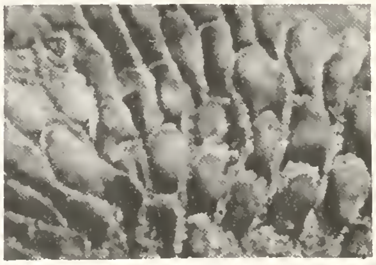
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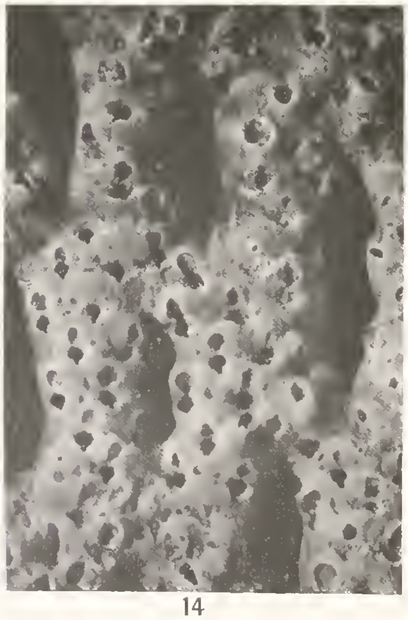
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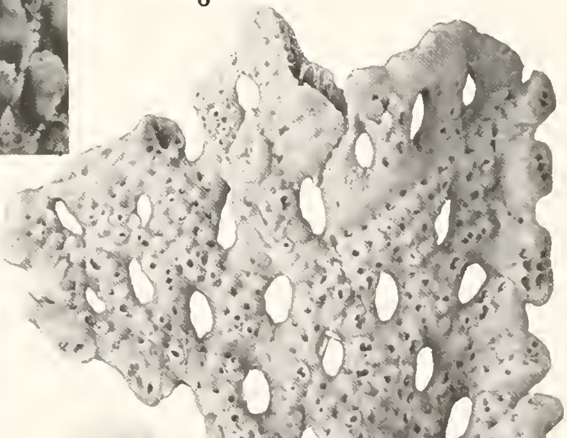
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 267.

PLATE 23.

FIGS. 1–3. *Porella (Palmicellaria) convoluta* Ulrich and Bassler, 1904. (p. 150.)

1. The convoluted, bifoliate zoarium, natural size.
2. Zooecia, × 20, showing the prominent mucro and the avicularium.
3. Surface of another fragment, × 20, with several closed zooecia.

Miocene (Calvert formation): Reeds, Maryland.

FIG. 4. *Porella (Palmicellaria) punctata* Ulrich and Bassler, 1904. (p. 150.)

The bifoliate type specimen, × 20.

Miocene (Calvert formation): Reeds, Maryland.

FIGS. 5–10. *Porella reversa* Ulrich and Bassler, 1904. (p. 148.)

5. Portion of the incrusting zoarium, × 20, showing the zooecia with thin raised borders.
6. Another zoarium, × 20, with ovicelled zooecia.
7. Drawing showing usual aspect of the ovicelled and unovicelled zooecia, × 28.5.
8. Zooecia of a specimen with ovicells, × 28.5.
9. Several zooecia, × 28.5, with the boundaries well defined.

Miocene (St. Mary's formation): Cove Point, Maryland.

10. A view of the zooecial walls after abrasion of the frontal, × 20.

Miocene: Kuhns, Carteret County, North Carolina.

FIGS. 11–17. *Retepora doverensis* Ulrich and Bassler, 1904. (p. 152)

11–13. Three specimens, natural size.

14. Portion of a type specimen, × 20, showing the fissured ovicell and the wide irregular rimule spiramen.

15. Noncelluliferous side of a zoarium, × 20.

16. One of the original types, × 8, with ovicelled zooecia.

17. Drawing of several zooecia, × 30.

Miocene (Choptank formation): Dover Bridge, Maryland.

PLATE 24.

FIGS. 1, 2. *Adeona heckeli* Reuss, 1847. (p. 158.)

1. Surface of zoarium, × 20, showing convex, young zooecia.

2. The normal aspect of the zoarium, × 20, in which the zooecia are flat.

Miocene (Duplin marl): Wilmington, North Carolina.

FIGS. 3, 4. *Tremogasterina horrida*, new species. (p. 168.)

3. The free, bilamellar zoarium, natural size.

4. Zooecial surface, × 20, illustrating the large median orbicular pore surrounded by a line of areolar pores, and the immense triangular avicularium.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.

FIGS. 5–8. *Adeonellopsis coccinella*, new species. (p. 161.)

5. Fragments of the bilamellar zoarium, natural size.

6. Surface of the bilamellar zoarium, × 20, with poorly oriented zooecia.

7. Another surface, × 20, with more regularly arranged zooecia and showing the frontal perforated by stellate pores.

8. Interior of zooecia, × 20, illustrating the frontal perforations.

Lower Miocene (Chipola marl): Chipola River, Calhoun County, Florida.

FIG. 9. *Lagenipora (?) brevicollis*, new species. (p. 171.)

Zooecia of the incrusting zoarium, × 20, illustrating the form of the apertura, the tremopores, and the occasional small avicularia.

Miocene (Duplin marl): Kuhns, Carteret County, North Carolina.

FIGS. 10–13. *Holoporella parvula*, new species. (p. 175.)

10. The free irregularly branched zoarium, natural size.

11. Surface, × 20, illustrating the very small, cumulate zooecia.

12. Another portion of the type, × 20, showing the small umbo before the apertura more clearly.

13. Zooecia, × 20, with areolar pores distinctly visible.

Miocene (Duplin marl): Cape Fear River, 28 miles northwest of Wilmington, North Carolina.

FIG. 14. *Holoporella rostrifera*, new species. (p. 175.)

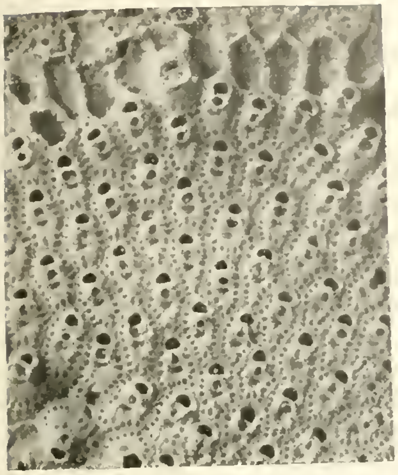
The incrusting zoarium, × 20, exhibiting the erect, indistinct zooecia with the four salient rostra about the apertura.

Miocene (Yorktown formation): York River, Virginia.

FIG. 15. *Aetea anguina* (?) Linnaeus, 1758. (p. 49.)

The incrusting network, × 20, referred doubtfully to this recent species.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.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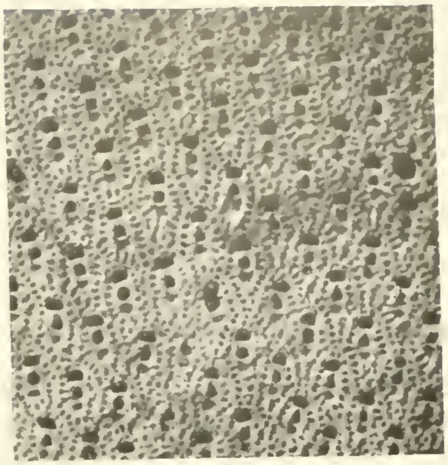
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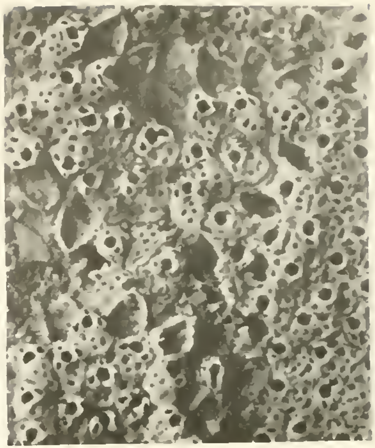
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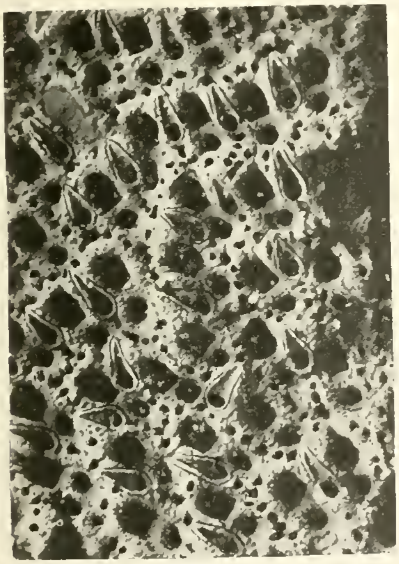
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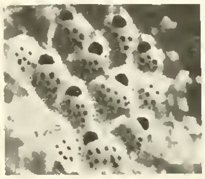
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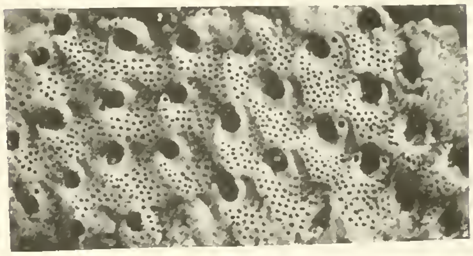
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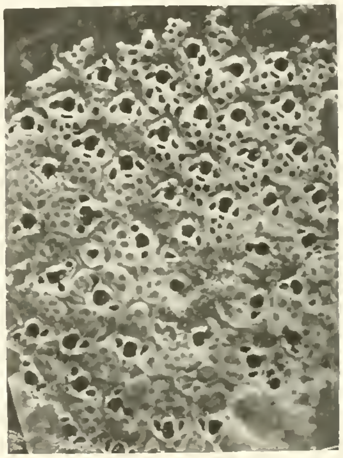
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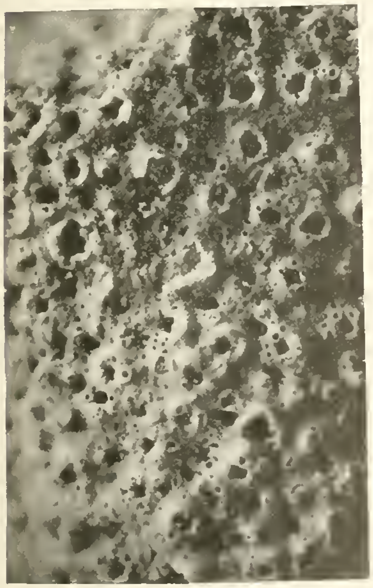
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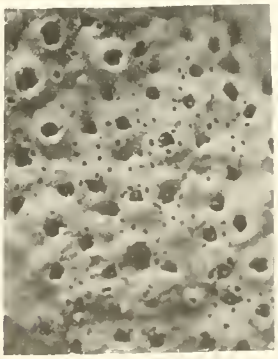
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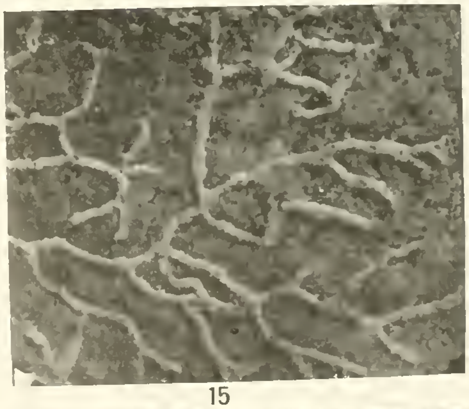
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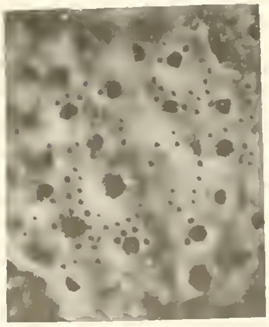
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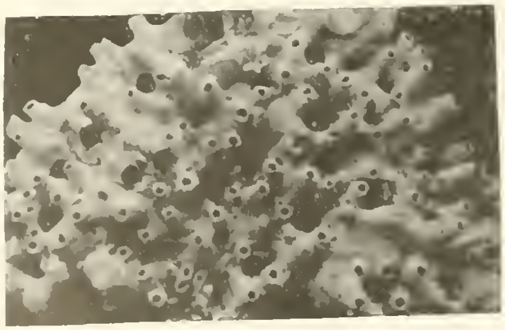
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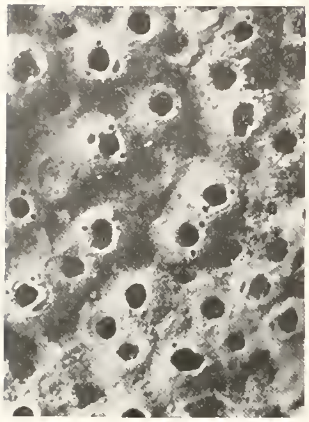
NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 263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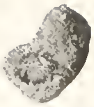
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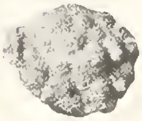
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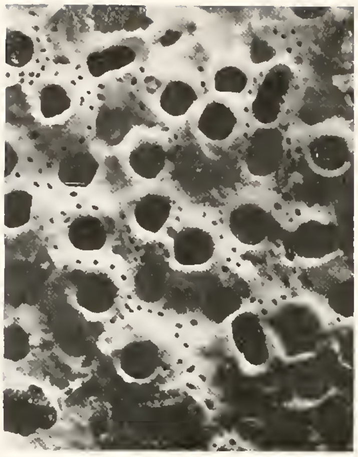
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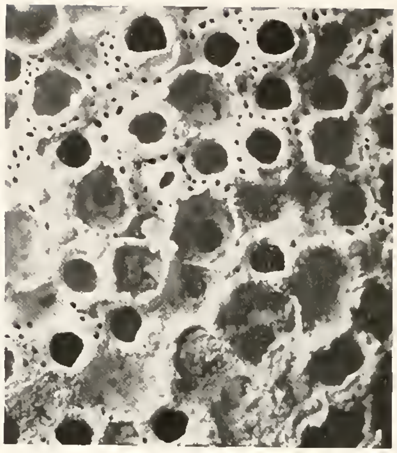
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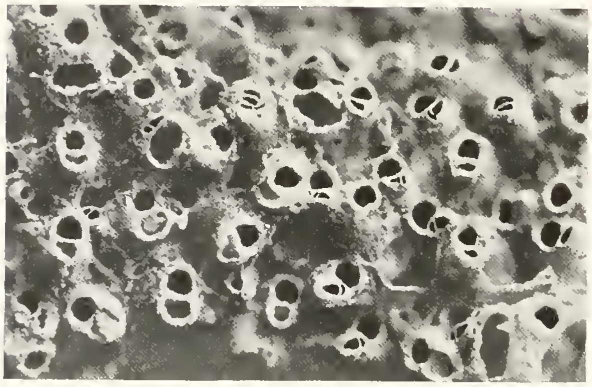
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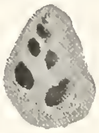
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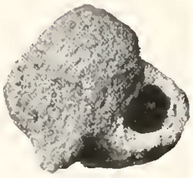
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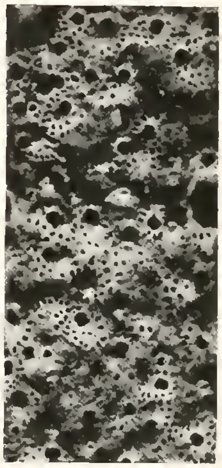
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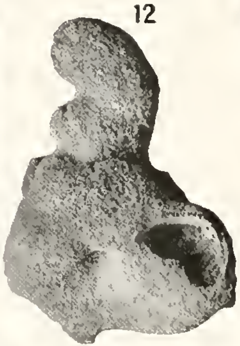
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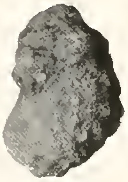
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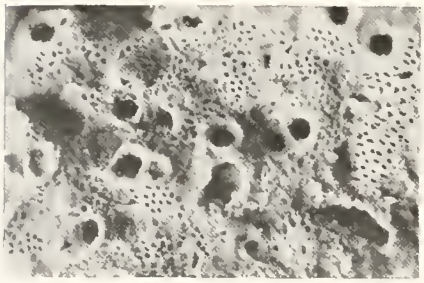
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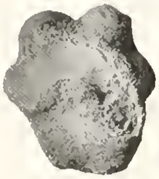
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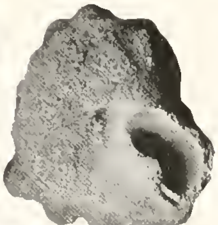
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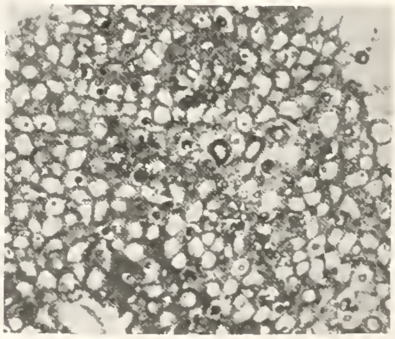
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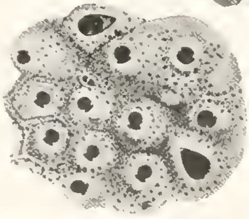
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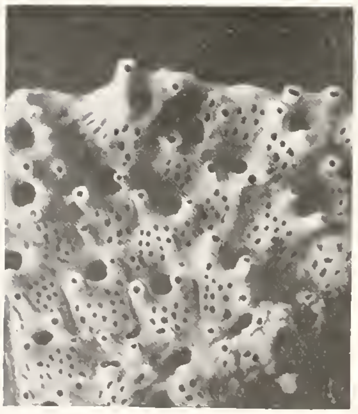
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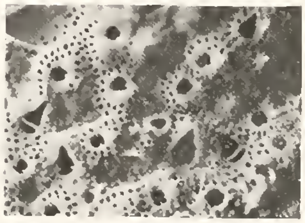
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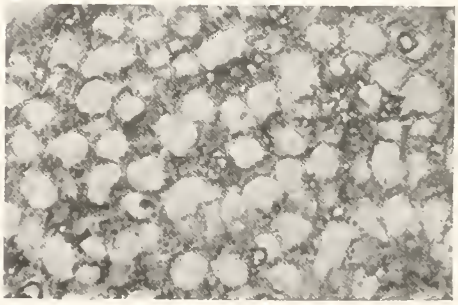
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 269

Plate 25.

Figs. 1, 2. *Holoporella* (?) *echinata*, new species. (p. 177.)

1. The globular zoarium, natural size.

2. Zooecia, × 20, showing two oral spines and the absence of areolar pores.

Miocene (Yorktown formation): Yorktown ,Virginia.

Figs. 3–6. *Holoporella orbifera*, new species. (p. 177.)

3, 4. Two examples of the irregular, massive zoaria, natural size.

5. Portion of the zoarium, × 20, with large interzooecial avicularia. The areolar pores, the convex frontal, and the form of the apertura are well shown.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

6. Another surface, × 20, illustrating the usual characters noted.

Miocene (Duplin marl): Wilmington, North Carolina.

Fig. 7. *Holoporella massalis*, Ulrich and Bassler, 1904. (p. 177.)

Surface of the original type, × 20.

Miocene (St. Mary's formation): St. Marys River, Maryland.

Fig. 8. *Cellepora cribrosa* Ulrich and Bassler, 1904. (p. 183.)

Photograph of the type specimen, × 20.

Miocene (Calvert formation): Reeds, Maryland.

Fig. 9. *Holoporella subturrita*, new species. (p. 176.)

The incrusting zoarium, × 20, illustrating the four prominent rostra with avicularia, about each apertura.

Miocene (Duplin marl): Twenty-eight miles northwest of Wilmington, North Carolina.

Figs. 10–13. *Cellepora minuta*, new species. (p. 182.)

10–12. Two zoaria, natural size, with a third cut through the middle, showing growth upon gastropod shells.

13. Surface of a zoarium, × 20, illustrating the small size of the zooecia, a single row of areolar pores and the occurrence of small tubular avicularia only.

Miocene (Duplin marl): Wilmington, North Carolina.

Figs. 14–20. *Cellepora maculata* Ulrich and Bassler, 1904. (p. 182.)

14–16. Three zoaria, natural size, growing as usual upon gastropod shells.

17. Drawing of the surface, × 17, illustrating the shape of the apertura and the two kinds of avicularia as well as the areolar pores.

18. Photograph of zooecia, × 20, illustrating the large interzooecial avicularia.

19. A section through a zoarium, × 10, showing the accumulation of the zooecia.

20. An enlargement of the same, × 25, showing the arrangement and structure in more detail.

Miocene (Calvert formation): Plum Point, Maryland.

Plate 26.

Figs. 1–3. *Ceriopora virginiana*, new species. (p. 193.)

1. The irregular globular zoarium, natural size.

2. Surface, × 12, showing the thin walls of the polygonal zooecia.

3. Portion of the same, × 25.

Miocene (Yorktown formation): One mile northeast of Suffolk, Virginia.

Figs. 4–6. *Atelesopora reptans*, new species. (p. 191.)

4. Zoaria, natural size, incrusting a shell.

5. A complete zoarium, × 12, with the zone of growth showing small lobes.

6. A narrow flabellate zoarium, × 12, with a thick zone of growth.

Miocene (Duplin marl): Muldrows Mills, 5 miles south of Mayville, Sumter County, South Carolina.

Fig. 7. *Proboscina mesleri*, new species. (p. 193.)

The type specimen, × 12, showing the long branches with three rows of zooecia.

Miocene (Duplin marl): Wilmington, North Carolina.

Fig. 8. *Idmonea(?) expansa* Ulrich and Bassler, 1904. (p. 200.)

The irregular, flabellate, incrusting zoarium, × 12.

Miocene (St. Mary's formation): Cove Point, Maryland.

Figs. 9–12. *Theonoa glomerata* Ulrich and Bassler, 1904. (p. 201.)

9, 10. A large specimen, natural size, and a photograph, × 4.

11. A small specimen, natural size.

12. Another view of the same, × 4.

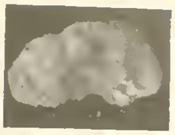
Figs. 13–15. *Idmonea planula*, new species. (p. 199.)

13. The free zoarium, natural size.

14. Anterior side, × 12, showing the salient fascicles closely arranged and opposite to each other.

15. Posterior side of the same specimen, × 12, illustrating the flat, transversely striated dorsal.

Miocene (Choctawhatchee marl): Jackson Bluff, Ocklocknee River, 25 miles southwest of Tallahassee, Florida.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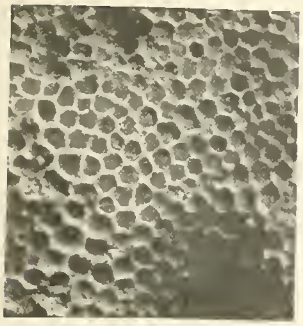
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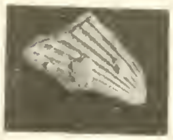
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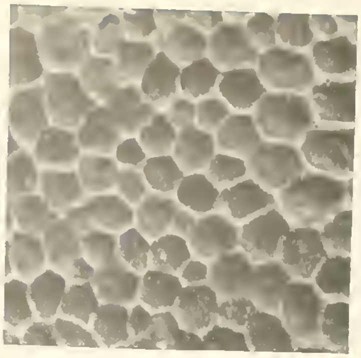
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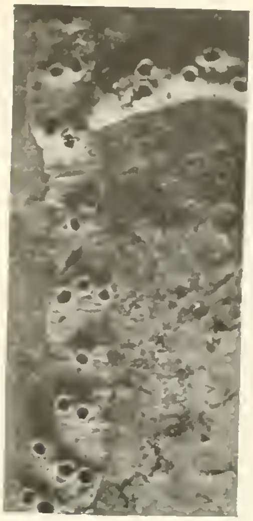
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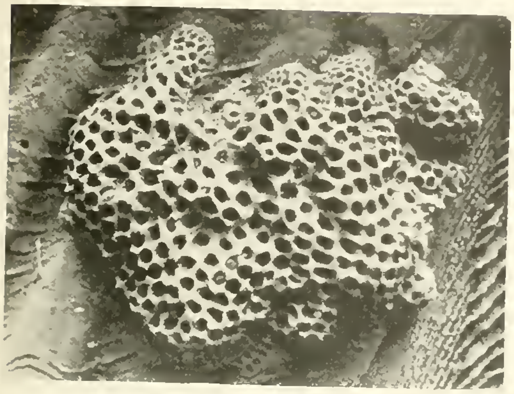
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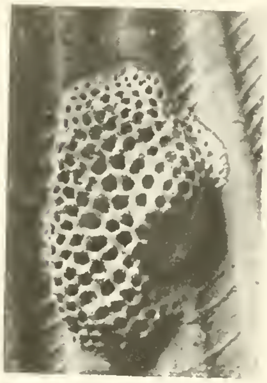
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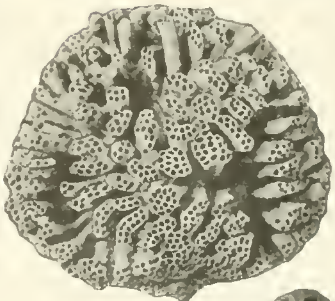
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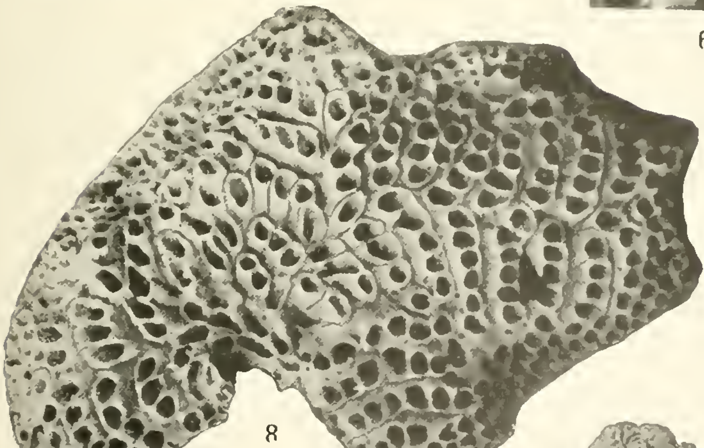
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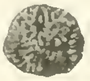
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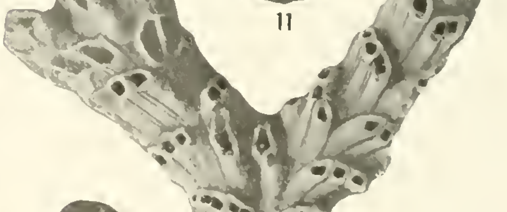
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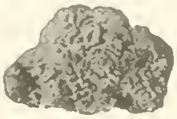
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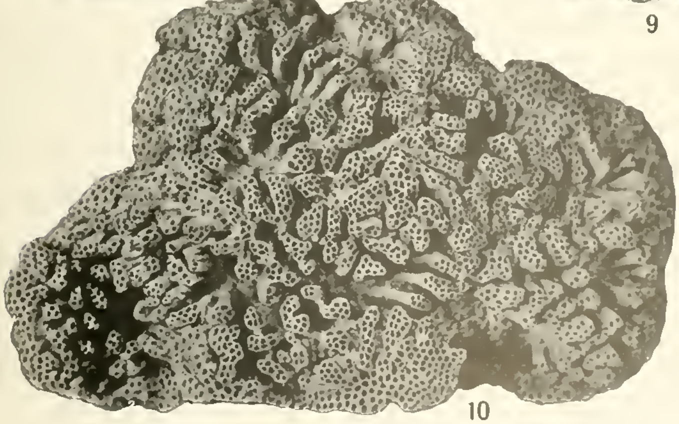
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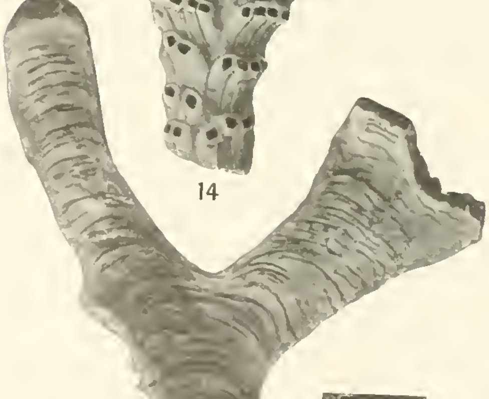
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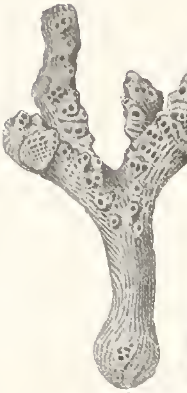
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 270.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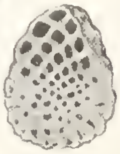
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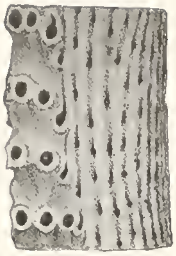
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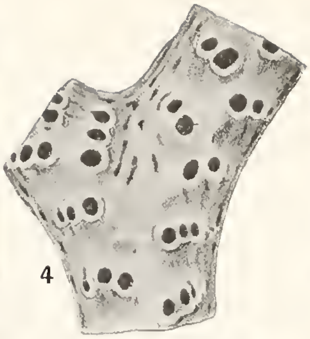
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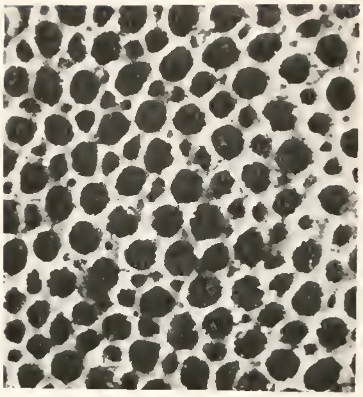
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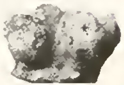
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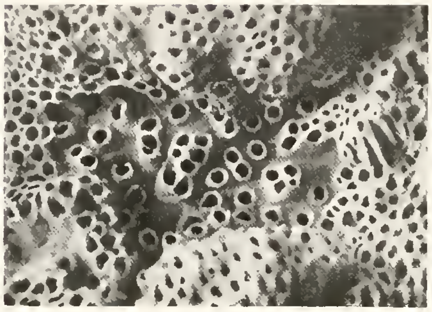
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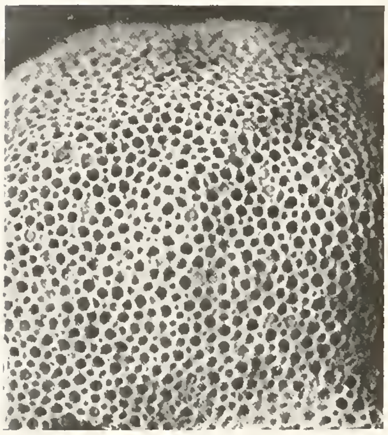
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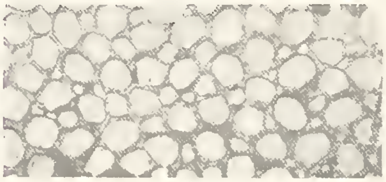
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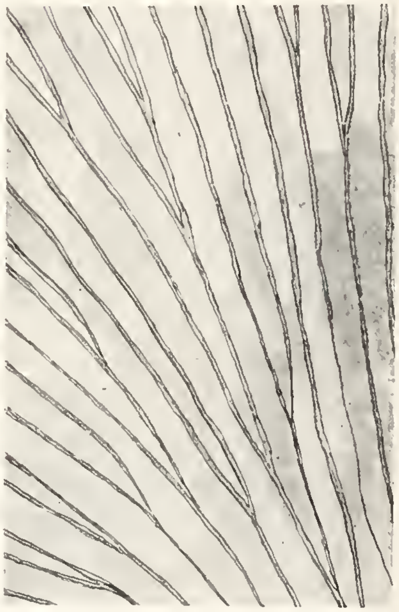
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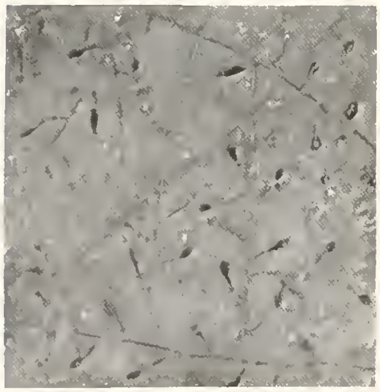
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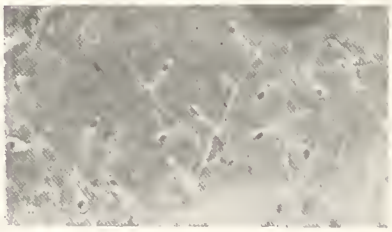
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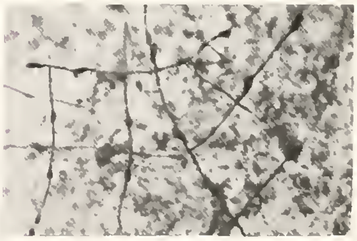
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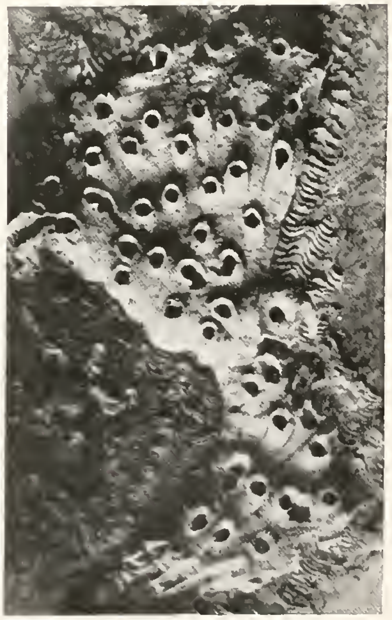
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 271

Plate 27.

Figs. 1–4. *Crisina striatopora* Ulrich and Bassler, 1904. (p. 200.)
1. The type specimen, × 5.
2. View of the end of a branch, × 17.
3. Lateral view of one of the branches, × 23.
4. Upper surface of the same branch, × 17.
Miocene (Choptank formation): Jones Wharf, Maryland.

Figs. 5–11. *Tretocycloecia avellana*, new species. (p. 206.)
5–6. Two specimens natural size, showing variations in the free spherical zoarium.
7. Surface of a globular specimen, × 12.
8. Zoarial surface, × 25.
9. Surface, × 12, showing that the ovicell is large and irregular.
10. A tangential thin section, × 25.
11. A longitudinal thin section, × 25, showing the hollow walls and the absence of diaphragms.
Miocene (Duplin marl): one-half mile above Edenhouse Point, Chowan River, North Carolina.

Figs. 12–13. *Spathipora longicauda*, new species. (p. 16.)

A portion of the type specimen, × 20 and × 10, illustrating the elongated fusiform zooecia with a long peduncle attached to the canalicules at an angle of about 45°.

Miocene (St. Mary's formation): Bowler's wharf, 18 miles above Urbana, Middlesex County, Virginia.

Fig. 14. *Spathipora cucullata*, new species. (p. 16.)

The type specimen, × 20, showing the zooecia embedded in the shell substance.

Miocene (Yorktown formation): Beulahland, Virginia.

Figs. 15–16. *Terebripora parvicella*, new species. (p. 15.)

Two views of the type specimen, × 10 and × 20, illustrating the very thin canalicules branching almost at right angles and the slightly oblique arrangement of the zooecia.

Miocene (Duplin marl): two miles southwest of Magnolia, North Carolina.

Fig. 17. *Berenicea flabellum?* Reuss, 1847. (p. 194.)

The American example, × 12, referred doubtfully to this European species.

Miocene (Yorktown formation): Weavers Pond, Gloucester County, Virginia.

PLATE 28.

FIGS. 1-12. *Tretocycloecia tortilis* Lonsdale, 1845. (p. 206.)

1, 2. Fragments of the irregularly branched, cylindrical zoarium, natural size.

3. Surface of a specimen, × 12, with a group of broken ovicells. The superior layer of the ovicells has disappeared in fossilization.

4. A large isolated ovicell, × 12, with its upper surface broken away.

5. Surface of ordinary zooecia, × 12, showing the mesopores grouped together in many parts of the branch.

6. Same surface, × 25, illustrating the thickness of the zooecial walls.

7, 8. Another surface, × 12 and a portion of the same, × 25, in which the zooecia have thin walls and the mesopores are arranged irregularly between the apertures.

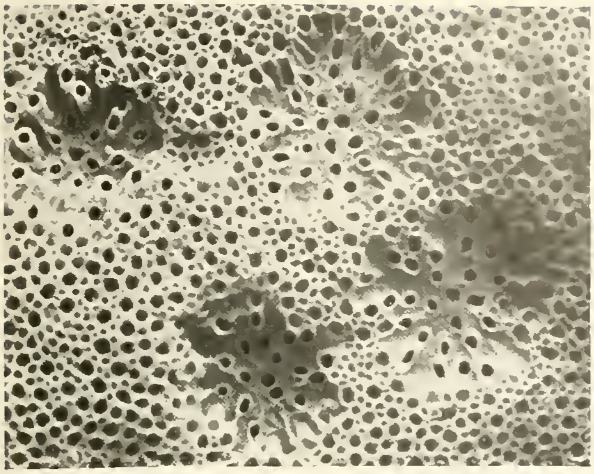
9. Outer portion of longitudinal thin section, × 25.

10. Tangential thin section, × 25.

11. Several zooecia of the same, × 100, showing that the internal walls are much calcified and are separated by a less dense tissue.

12. Portion of a transverse thin section, × 25.

Miocene (Yorktown formation): Yorktown, Virginia.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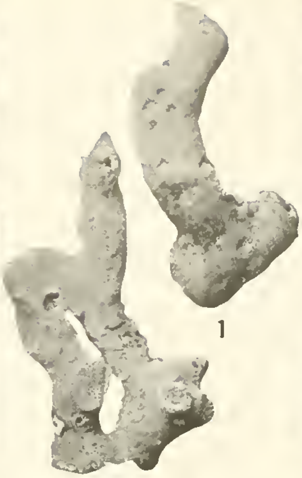
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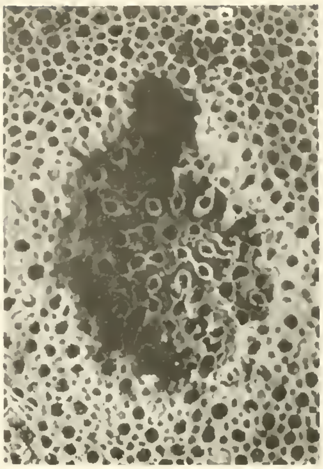
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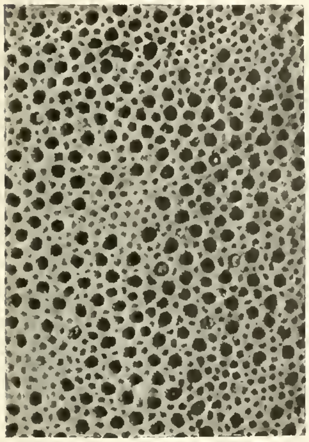
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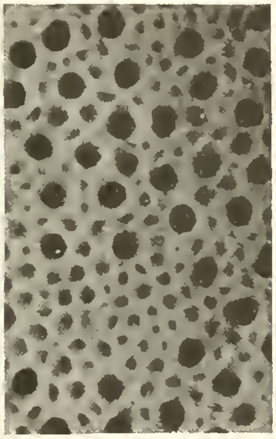
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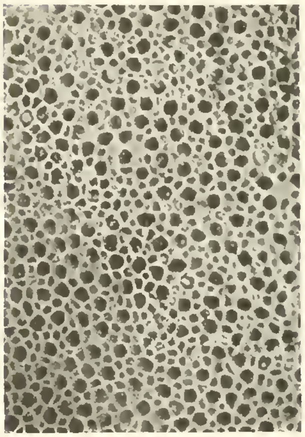
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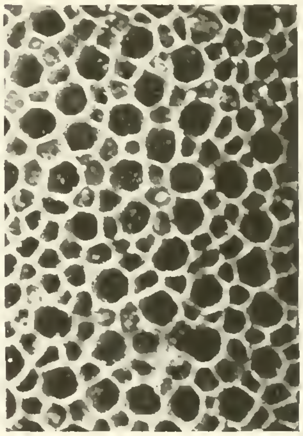
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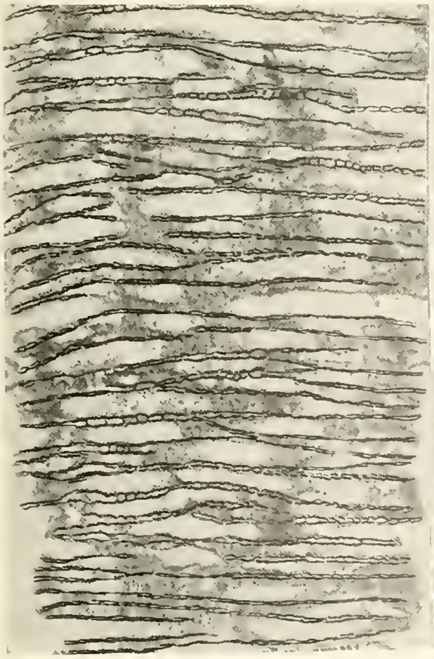
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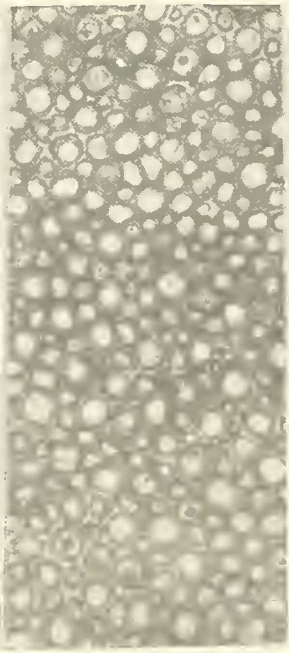
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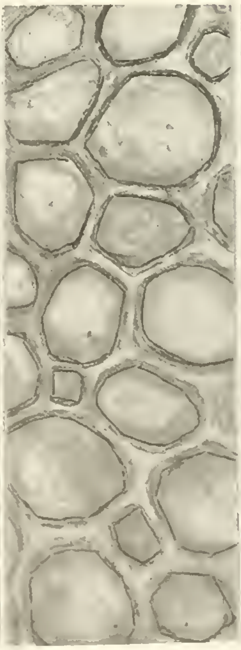
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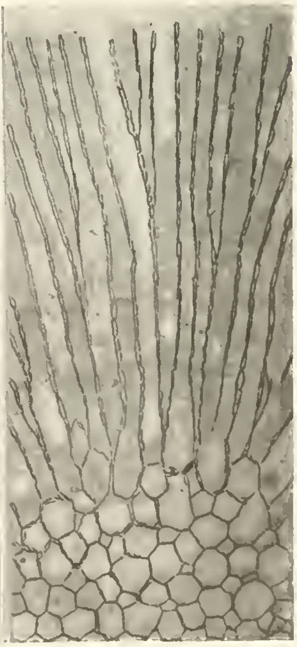
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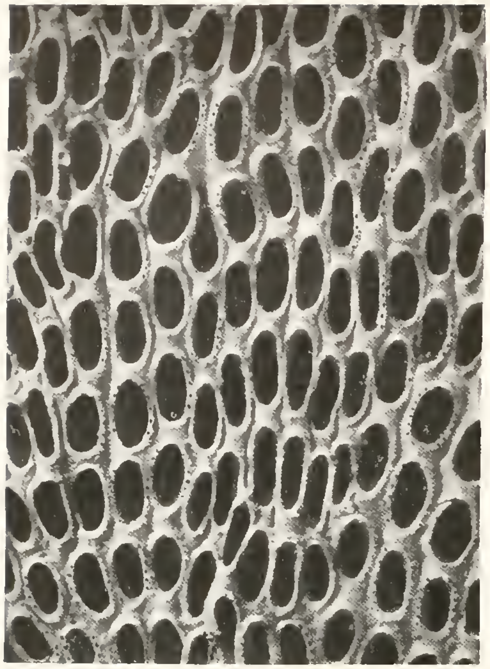
NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 272.



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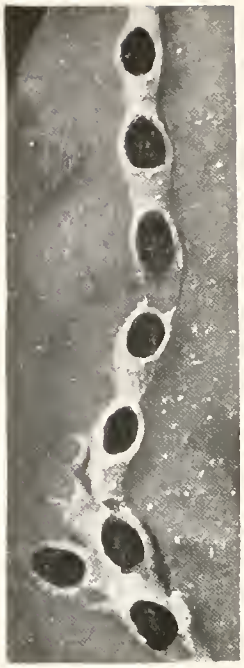

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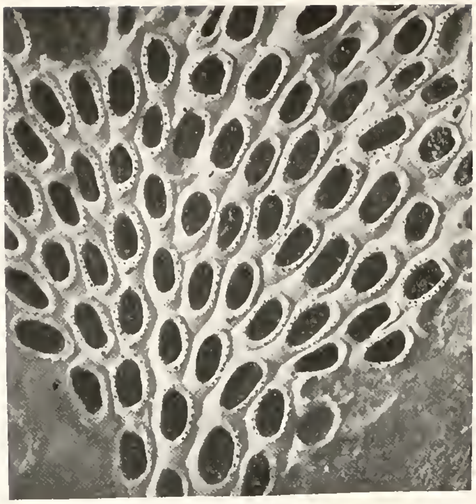

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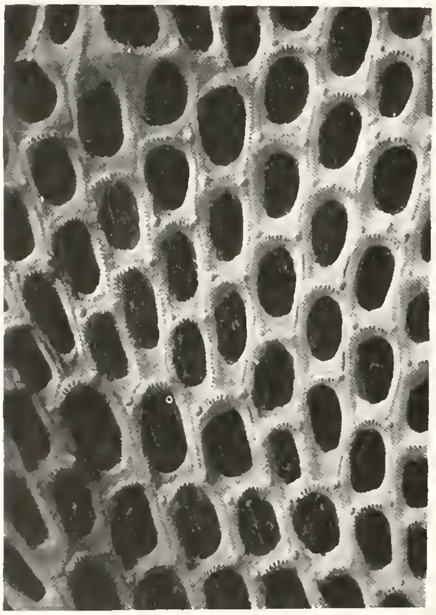

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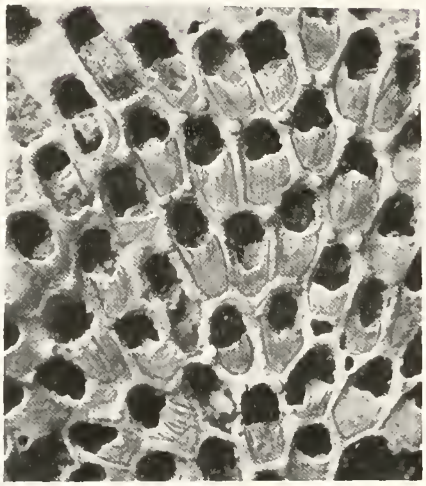

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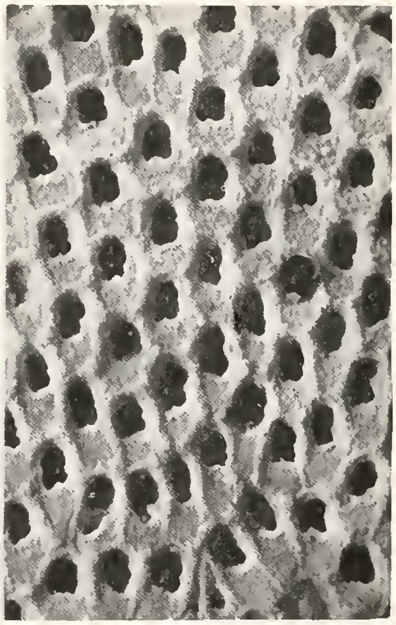

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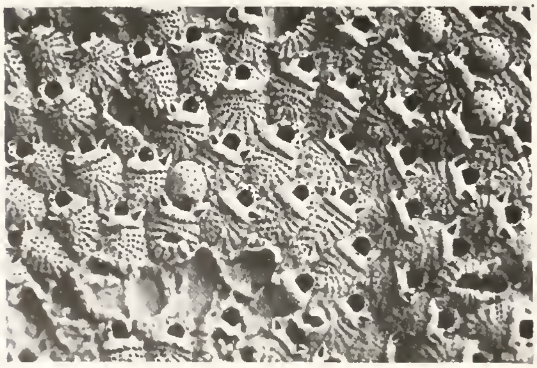

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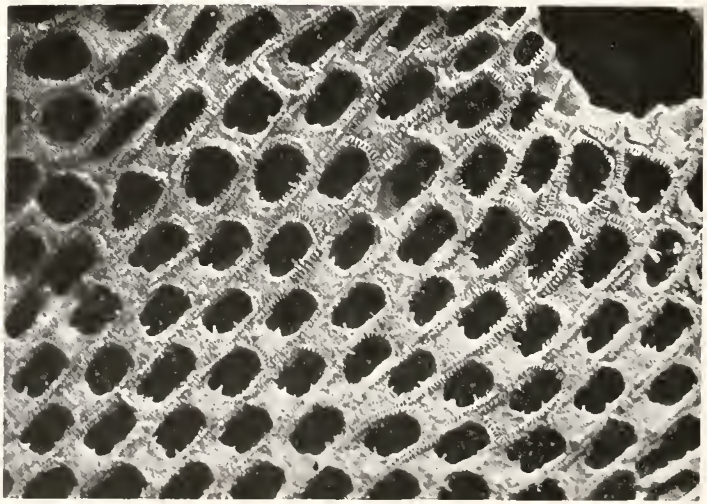

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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 273.

Plate 29.

Figs. 1–3. *Electra monostachys* Busk, 1854. (p. 17.)

1. An expanded zoarium, × 20.

Pleistocene: Wailes Bluff, near Cornfield Harbor, St. Marys County, Maryland.

2. Unilinear series of zooecia, × 20, with zooecia somewhat larger than usual.

Pleistocene: Santa Barbara, California.

3. A flabelliform zoarium, × 20.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

Fig. 4. *Membranipora lacroixii* Audouin, 1826. (p. 22.)

The incrusting zoarium, × 20, showing the finely striated mural rims and the small tubercle at each interzooecial angle.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

Figs. 5, 6. *Hemiseptella planulata*, new species. (p. 74.)

5. Portion of the incrusting zoarium, × 20, somewhat worn but showing the flat cryptocyst and the tubercles at the interzooecial angles.

6. A better preserved example, × 20, with the spinous processes visible.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

Fig. 7. *Puellina crassilabiata*, new species. (p. 91.)

The incrusting zoarium, × 20, showing the thick transverse lip along the edge of the apertura.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

Fig. 8. *Hemiseptella granulosa*, new species. (p. 74.)

The unilamellar zoarium, × 20, exhibiting the characteristic irregular opesial proximal border with spinous processes and the granulose mural rim.

Miocene: Charleston, South Carolina.

PLATE 30.

FIG. 1. *Dakaria parciporosa*, new species. (p. 98.)

The incrusting zoarium, × 20, exhibiting the form of aperture and the minute tremopores.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

FIGS. 2, 3. *Microporella tessellata* Tuomey and Holmes, 1857. (p. 122.)

2. Zooecia, × 20, showing a large avicularium placed lower than the apertura.

3. Ancestrular region, × 20, with several worn zooecia exhibiting the dietellae.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

FIGS. 4, 5. *Schizoporella marginata*, new species. (p. 107.)

4. Usual aspect of the incrusting zoarium, × 20.

5. Zooecia, × 20, with the marginal rims worn away.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

FIGS. 6-14. *Cyclocolposa perforata*, new species. (p. 135.)

6. Normal zooecia of the incrusting zoarium, × 20.

7. Ovicelled zooecia, × 20.

8. Portion of a zoarium, × 20, showing two ancestrular areas with their surrounding zooecia (numbered 1, 2, 3, 4, 5).

9. Ancestrular region, ×20, with the ancestrula covered by the pleurocyst of the adjacent zooecia

10. Zooecia, × 20, exhibiting the olocyst and illustrating that the pleurocyst is detachable.

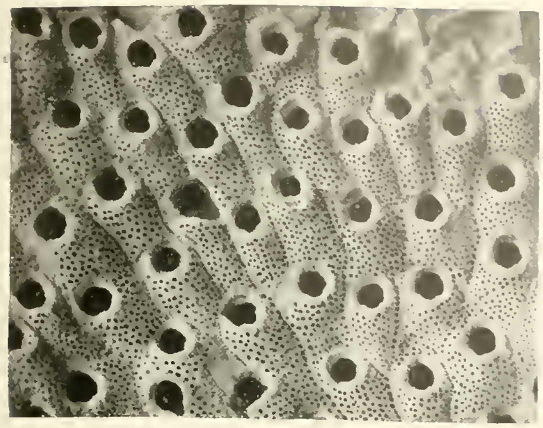
11. Ancestrular region, × 20. The ancestrula is reduced to its apertura.

12. Interior of the zooecia, × 20, exhibiting the olocyst.

13. Worn zooecia, × 20, showing the dietellae.

14. Ancestrular region, × 20, with surface worn away and illustrating the arrangement of the zooecia around the ancestrula.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.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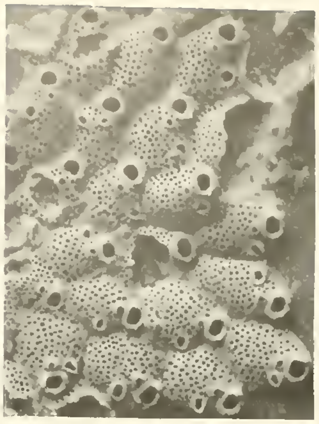
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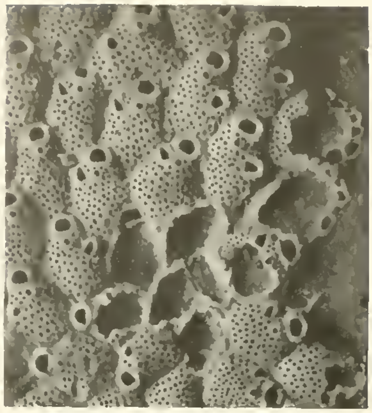
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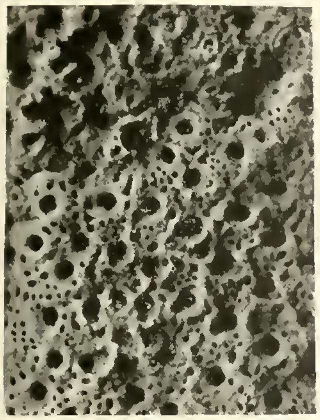
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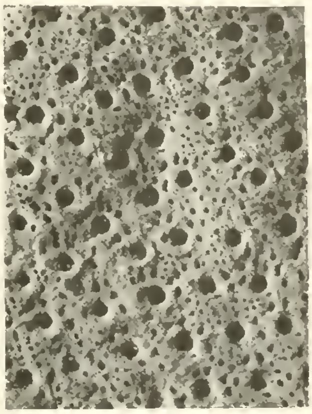
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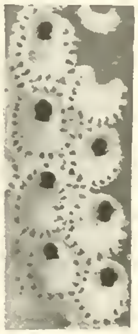
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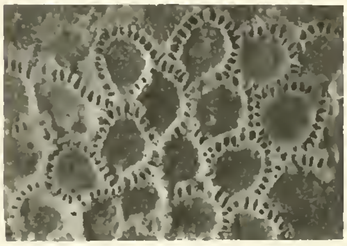
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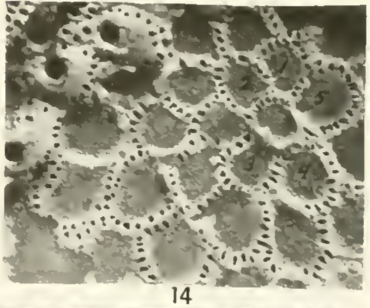
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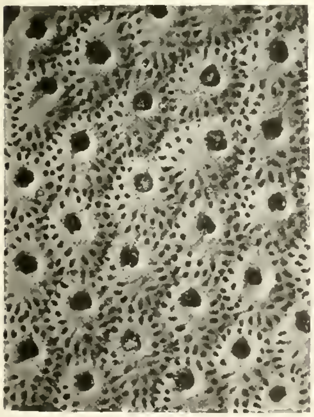
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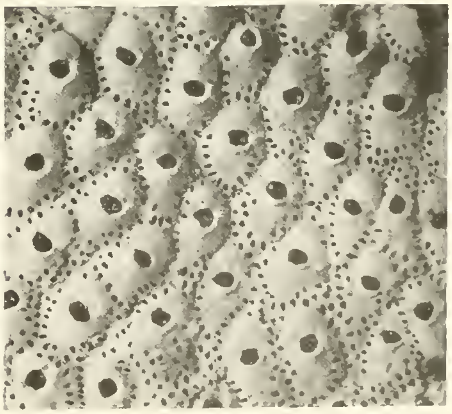
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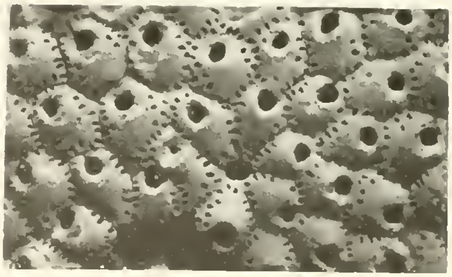
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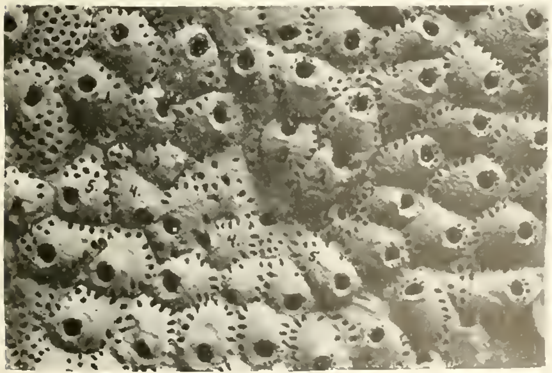
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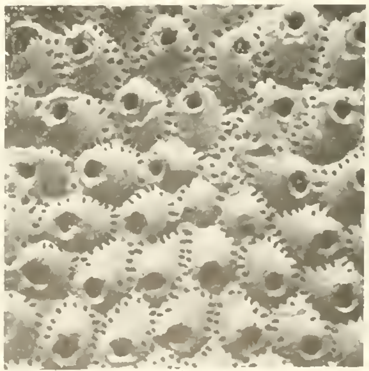
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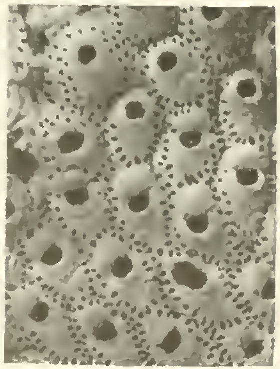
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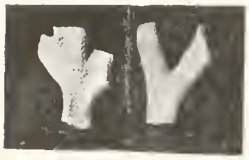
NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 274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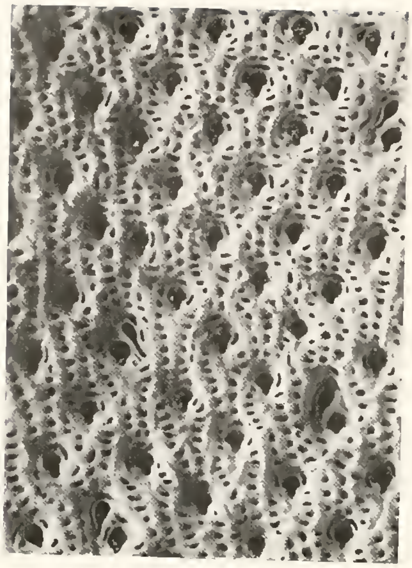
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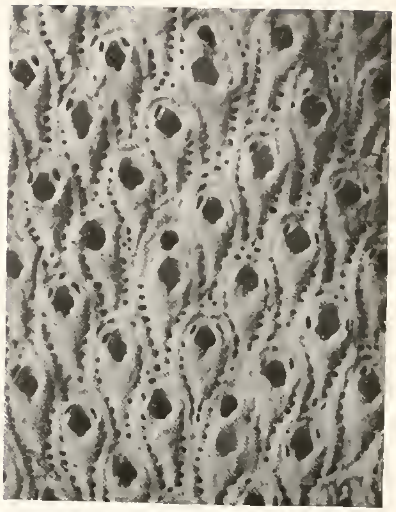
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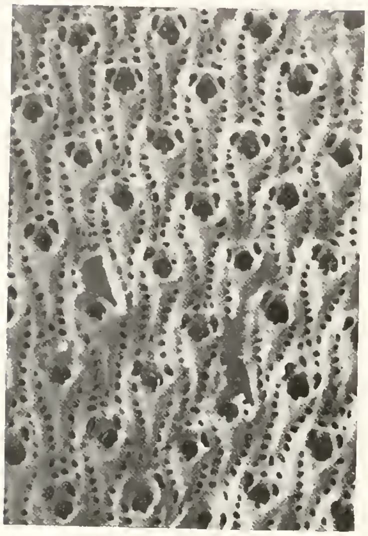
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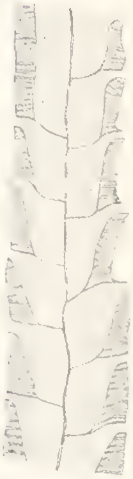
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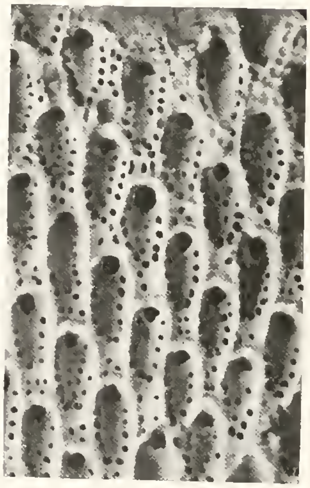
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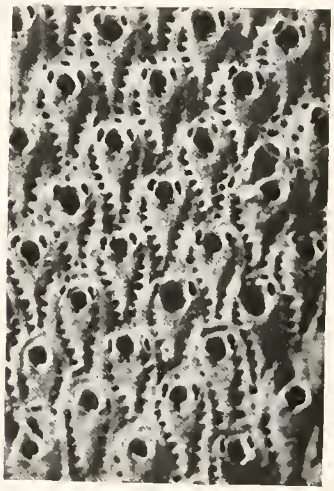
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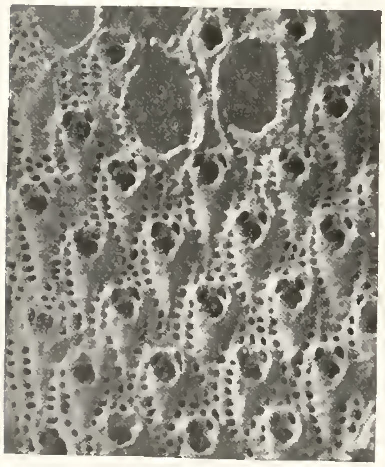
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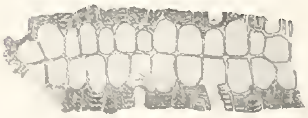
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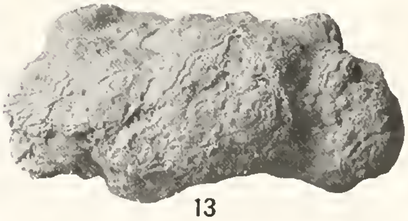
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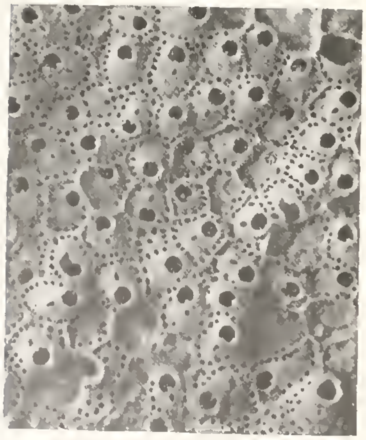
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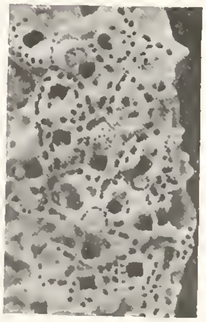
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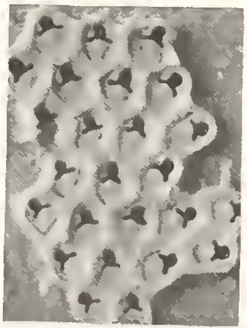
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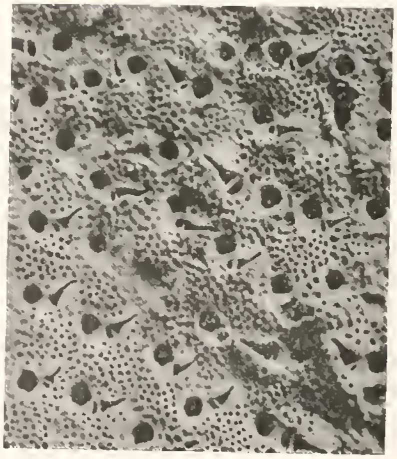
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 275.

PLATE 31.

FIGS. 1–9. *Metrarabdotos auriculatum*, new species. (p. 164.)

1. Two fragments of the narrow bilamellar zoarium, natural size.
2. Young convex zooecia, × 20. Two zooecia bear the large supraoral avicularium.
3. The usual aspect of the zooecial surface, × 20. The peristomice is deeply embedded.
4. Much calcified, convex zooecia, × 20.
5. Zoarial surface, × 20, showing two broken ovicells.
6. Surface of a young zoarium, × 20.
7. View of the interior of the zooecia, × 20, illustrating the areolar pores, and the subjacent olocyst.
8. Longitudinal thin section, × 12.
9. Transverse thin section, × 12, exhibiting the thick zooecial walls perforated by the areolar pores.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, and Monroe County (figs. 4–6), Florida.

FIGS. 10–11. *Smittina maleposita*, new species. (p. 144.)

10. Surface of the incrusting zoarium, × 20, showing the characteristic poorly oriented zooecia.

Pliocene (Caloosahatchee marl); Shell Creek, De Soto County, Florida.

11. Zooecia, × 20, several of which bear the large, globular, finely perforated ovicell.

Pleistocene: Vero, Florida.

FIG. 12. *Floridina parvicella*, new species. (p. 57.)

The incrusting type specimen, × 20.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

FIGS. 13,14. *Schizopodrella aculeata*, new species. (p. 104.)

13. The massive multiliamellar zoarium, natural size.
14. Zooecia, × 20, showing the wide tremopores and the large, long, pointed avicularium.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

PLATE 32.

FIGS. 1–4. *Holoporella bicornis*, new species. (p. 178.)

1, 2. Two zoarial masses, natural size.

3. The usual aspect of the surface, × 20.

4. Another surface, × 20, illustrating occurrence of the deep zooecia.

Pliocene (Waccamaw marl): Waccamaw River, Horry County, South Carolina.

FIG. 5. *Aimulosia radiata*, new species. (p. 140.)

The incrusting zoarium, × 20, illustrating the characteristic interareolar radiating costules.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.

FIGS. 6–10. *Holoporella albirostris* Smitt, 1872. (See also pl. 7, figs. 9–14.) (p. 174.)

6. The irregular, massive zoarium, natural size.

7. Usual aspect of the surface, × 20, showing the zooecia altered by fossilization.

8. Portion of a zoarium, × 20, showing numerous interzooecial avicularia.

9. Another zoarial surface, × 20, in which the areolar pores are closed and the oral sinus is limited by a spiniform umbo.

10. Interior of zooecia, × 20, illustrating zooecia around the ancestrula.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.

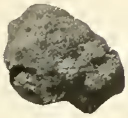
FIGS. 11–13. *Schismopora brevincisa*, new species. (p. 180.)

11. Surface of the incrusting zoarium. × 20

12. Another view, × 20, showing incomplete zooecia.

13. Zooecia, × 20, illustrating the form of the aperture and the areolar pores.

Pliocene (Caloosahatchee marl): Shell Creek, De Soto County, Florida.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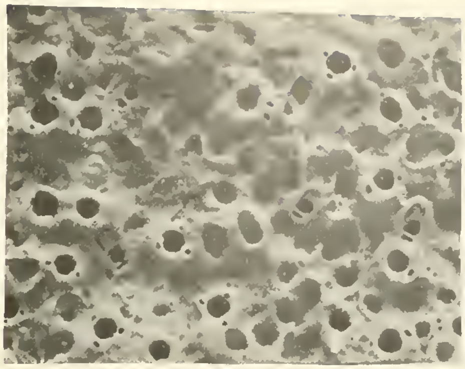
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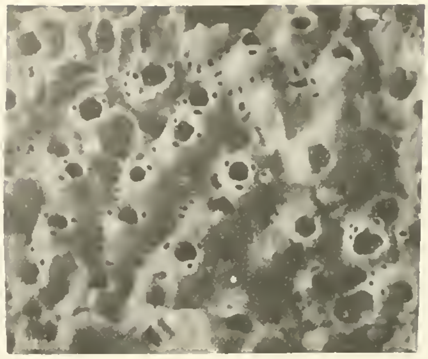
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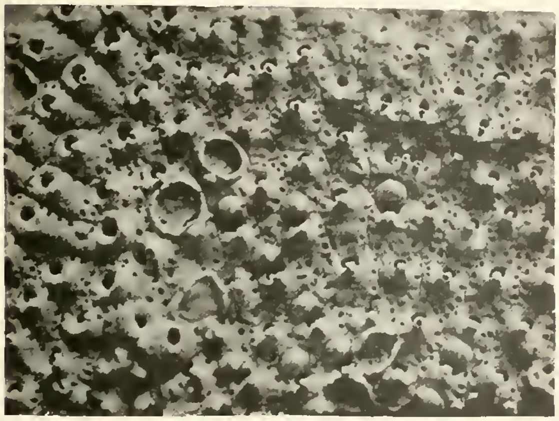
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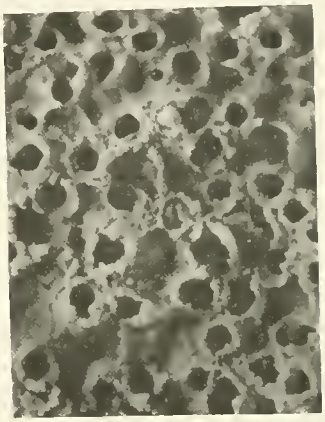
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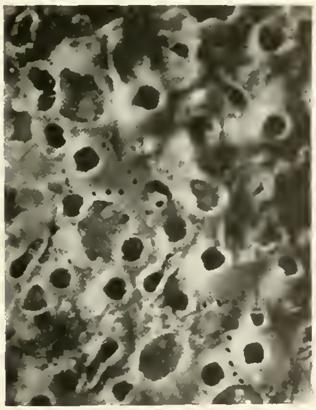
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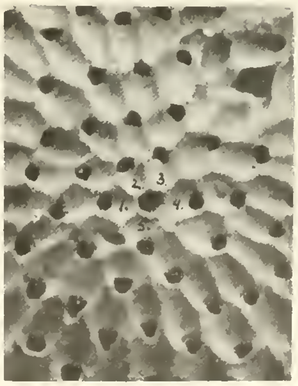

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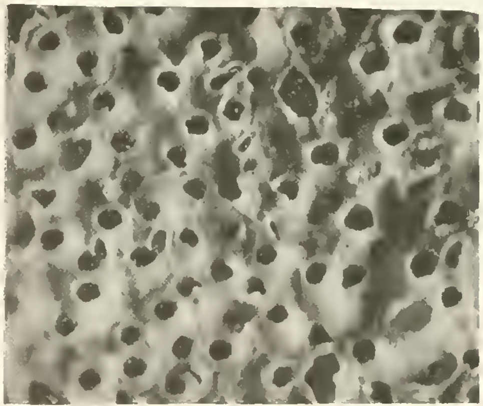
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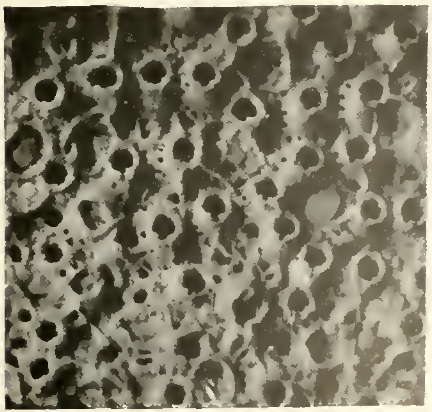
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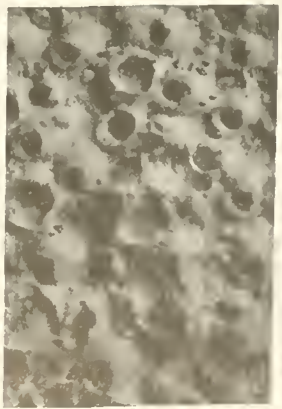
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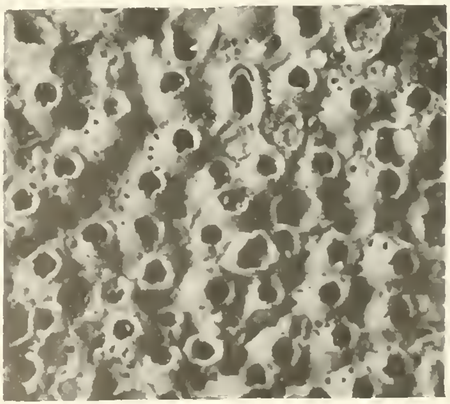
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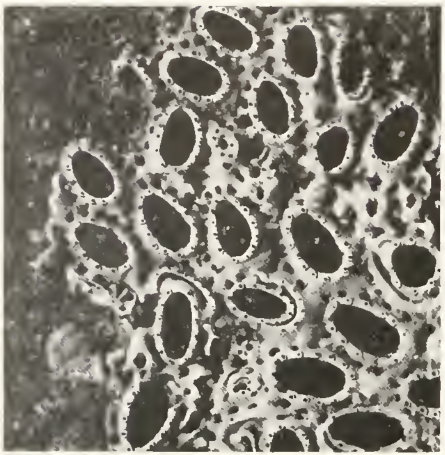
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 276.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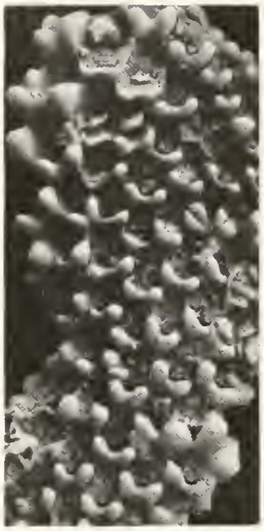
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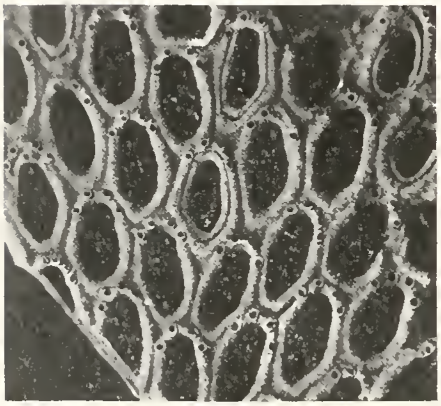
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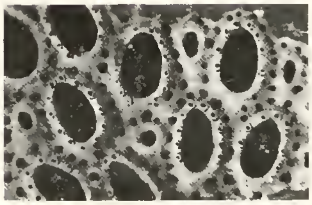
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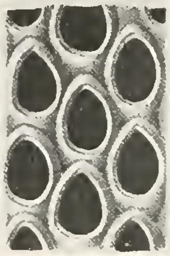
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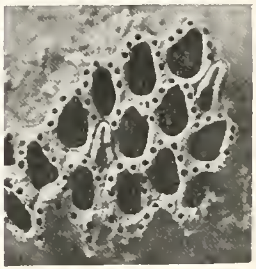
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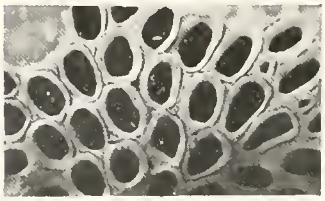
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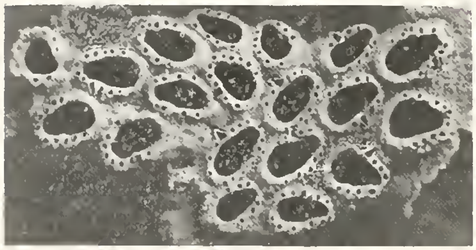
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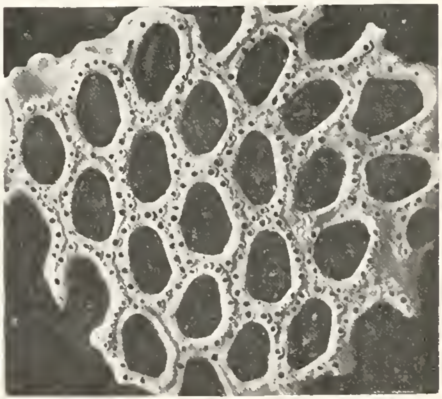
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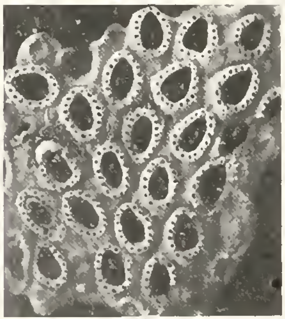
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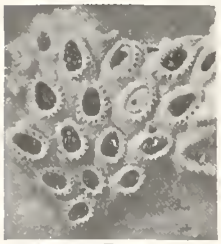
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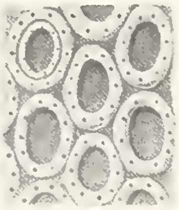
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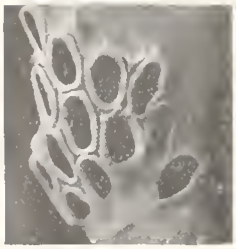
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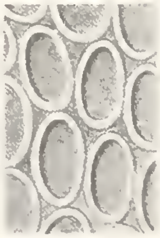
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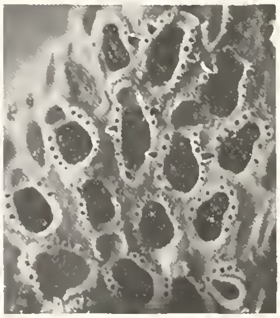
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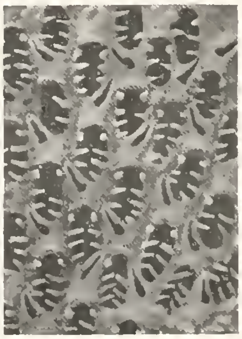
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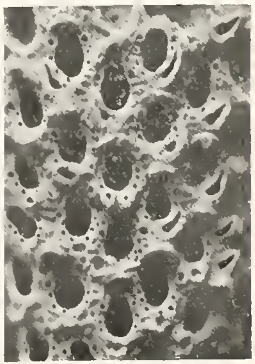
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 277

Plate 33.

Figs. 1, 2. *Mystriopora? areolata*, new species. (p. 19.)

1. The incrusting zoarium, × 20, showing the pyriform zooecia, the zooeciules, and the interzooecial areolae.

2. Another example, × 20, preserving longer zooeciules.

Pleistocene: Long Wharf Canyon, Santa Monica, California.

Figs. 3–5. *Membranipora tuberculata* Bosc, 1802. (p. 22.)

3. A fossil example of this widespread recent species, × 20, with very large tubercles.

4. Another example, × 20, with the tubercles less developed and the zooecia still retaining their chitinous parts.

Pleistocene: Santa Monica, California.

5. Surface of a recent specimen, × 20, showing identity with the fossil form.

Pacific Ocean: Santa Monica, California.

Fig. 6. *Membraniporina californica* Gabb and Horn, 1862. (p. 25.)

Original figure.

Pleistocene: Santa Barbara, California.

Figs. 7–9. *Conopeum barbarensis* Gabb and Horn, 1862. (p. 28.)

7. Gabb and Horn's figure of this species.

8. A small incrusting zoarium, × 20, showing the simplicity of structure.

9. The incrusting zoarium, × 20, showing the distinct zooecia with thin mural rim and several avicularia.

Pleistocene: Santa Barbara, California.

Fig. 10. *Hincksina quadrispinosa*, new species. (p. 38.)

The incrusting zoarium, × 20, illustrating the large elongated zooecia with four distal spines. Two regenerated zooecia are also shown.

Pleistocene: Rustic Canyon, Santa Monica, California.

Fig. 11. *Hincksina multispinata*, new species. (p. 38.)

Zooecia, × 20, of the incrusting zoarium, showing their small, elongated oval shape and the numerous hollow spines.

Pleistocene: Santa Barbara, California.

Fig. 12. *Callopora multipora* Gabb and Horn, 1862. (p. 44.)

Gabb and Horn's figure of this interesting species, which has not been rediscovered.

Pleistocene: Santa Barbara, California.

Fig. 13. *Callopora crassospina*, new species. (p. 41.)

The incrusting type specimen, × 20. The long fusiform avicularium and the six hollow spines are to be noted.

Pleistocene: Santa Barbara, California.

Figs. 14–16. *Cauloramphus triangularis*, new species. (p. 48.)

14. The incrusting type specimen, × 20. The numerous hollow spines and the small triangular avicularium are to be noted.

15. An example showing the ancestrular zooecia, × 20.

16. An ovicelled specimen, × 20.

Pleistocene: Santa Barbara, California.

Fig. 17. *Cauloramphus porosus*, new species. (p. 48.)

The incrusting type specimen, × 20, illustrating the large distinct zooecia separated by numerous pores.

Pleistocene: Santa Barbara, California.

Figs. 18, 19. *Callopora horrida* Hincks, 1880. (p. 43.)

18. Unilamellar, recent zoarium, × 20, with areal spines preserved.

Pacific coast near Los Angeles, California.

19. Zooecia of an incrusting fossil example, × 20, illustrating the large avicularia and the areal spines.

Pleistocene: Santa Barbara, California.

Plate 34.

Figs. 1–3. *Callopora circumclathrata* Hincks, 1881. (p. 43.)

1. Well-preserved specimen, × 20, with ovicells and avicularia.

2. Zoarial surface, × 20, showing the zooecia, avicularia areolar spaces, and the dietellae.

3. An ovicelled specimen, × 20, with large avicularia.

Pleistocene: Long Wharf Canyon, Santa Monica, California.

Fig. 4. *Rhamphonotus multispinatus*, new species. (p. 47.)

The incrusting type specimen, × 20, showing the two sizes of spines, a pair of large ones which constrict the opesium and numerous smaller ones.

Pleistocene: Santa Barbara, California.

Figs. 5–7. *Cupularia robertsoniae*, new species. (p. 82.)

5. The disk-shaped zoaria, natural size.

6. External inferior face, × 20.

7. Internal superior face, × 20.

Pleistocene: Long Wharf Canyon, Santa Monica, California.

Fig. 8–10. *Chaperia galeata* Busk, 1853. (p. 52.)

8. A Pleistocene example of this widespread recent and fossil species, × 20.

Pleistocene: Santa Barbara, California.

9. Ovicelled zooecia showing the characteristic rectilinear distal border.

10. Another fragment, × 20, with one complete ovicell and the spines and avicularia well shown.

Pleistocene: Rustic Canyon, Santa Monica, California.

Figs. 11–14. *Cellaria mandibulata* Hincks, 1882. (p. 86.)

11. A segment, × 20, showing a large avicularian zooecium.

12. Another fragment, × 20, with an avicularian zooecium. The round orifice of the inferior zooecium is the passage for the corneous joint bearing another segment.

13. An ordinary segment, × 20.

14. Several fragmentary segments, natural size.

Pleistocene: Los Angeles, California.

Figs. 15–18. *Cellaria fissurifera*, new species. (p. 85.)

15. A worn segment, × 20. The opening of the ovicell is very narrow.

16. Segment, × 20, bearing zooecium with round orifice through which the chitinous joint of another segment passed.

17. Segment, × 20, with rhomboidal zooecia and bearing two avicularia. The orifice of the ovicell is a narrow elongated fissure.

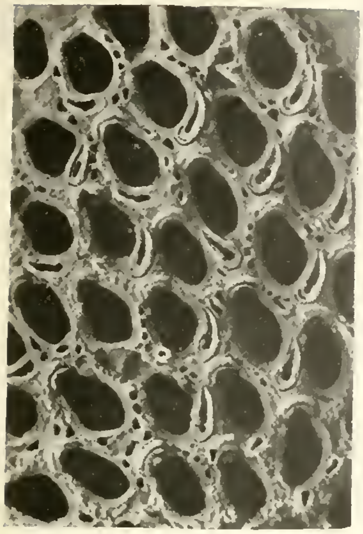
18. Several fragments, natural size.

Pleistocene: Rustic Canyon, Santa Monica, California.

Figs. 19, 20. *Cellaria diffusa* Robertson, 1905. (p. 86.)

A segment natural size and enlarged, × 20, illustrating the characters of this beautiful species. The orifice of the ovicell has the characteristic proximal tongue.

Pleistocene: Rustic Canyon, Santa Monica, California.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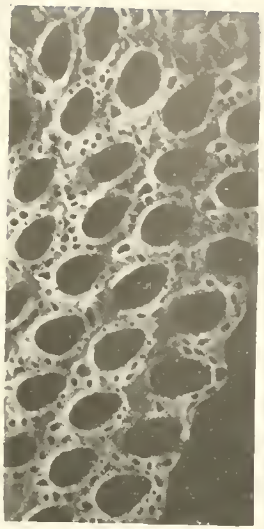
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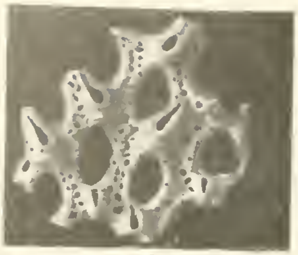
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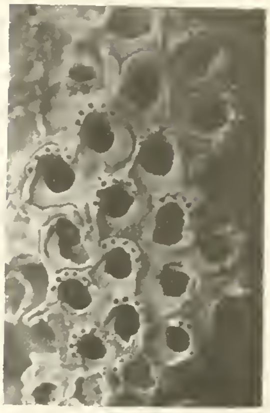
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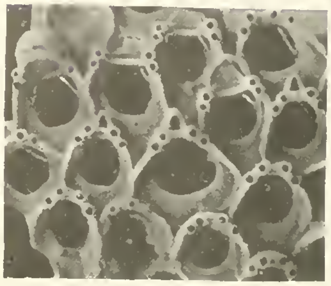
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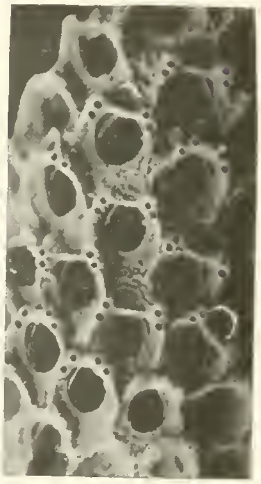
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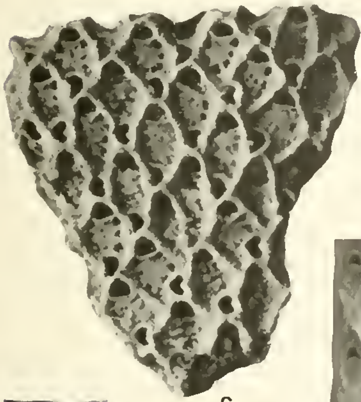
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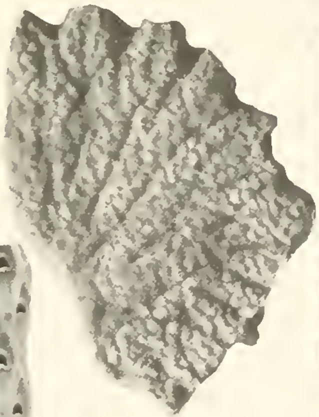
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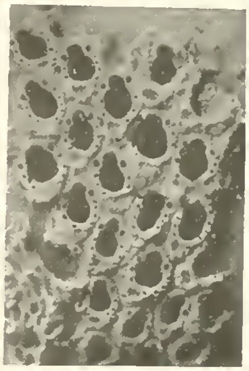
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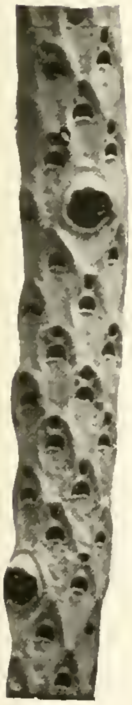
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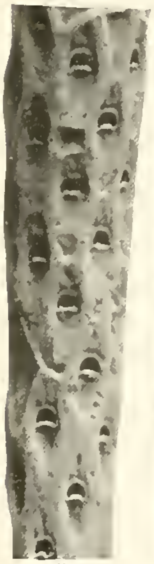
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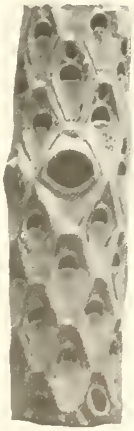
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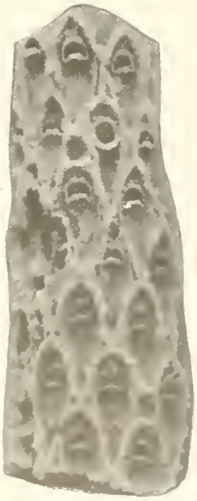
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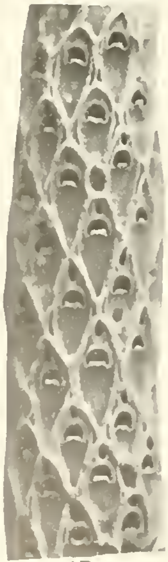
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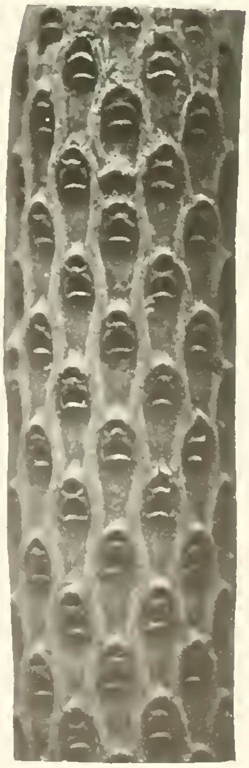
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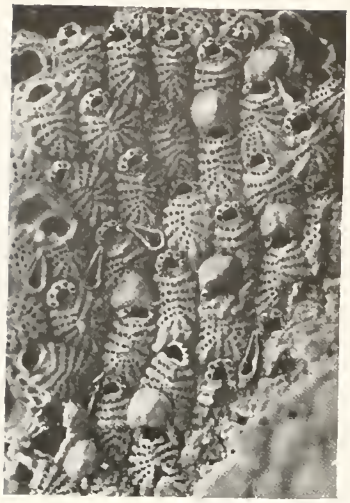
NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 278.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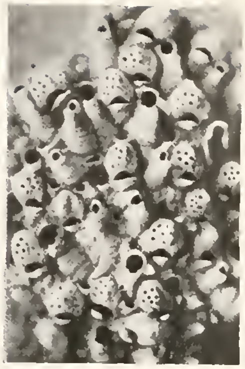
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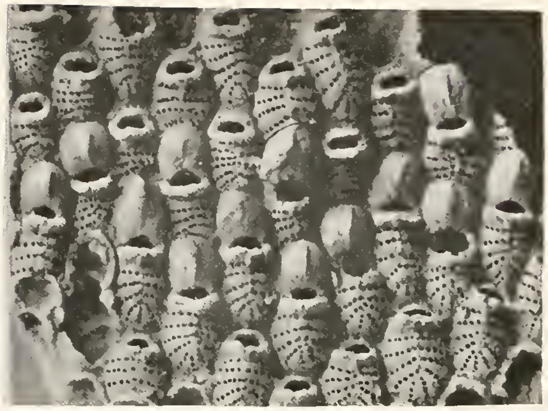
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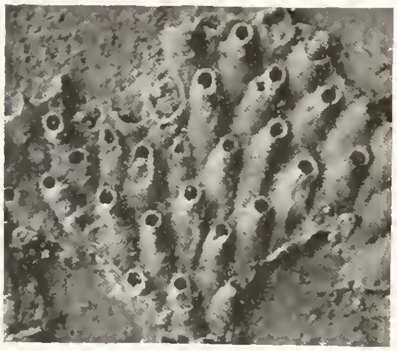
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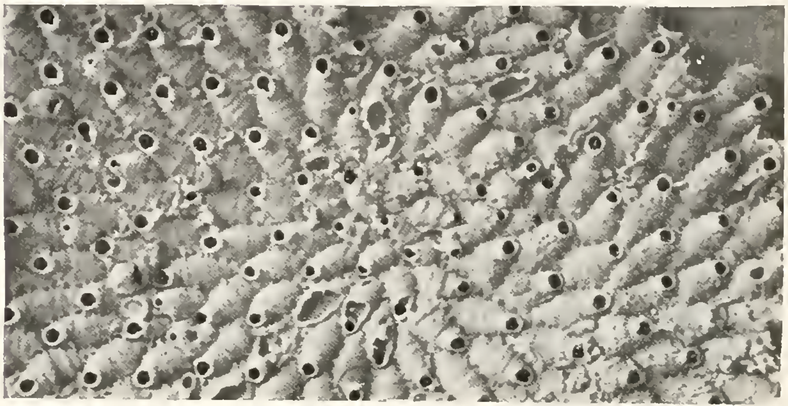
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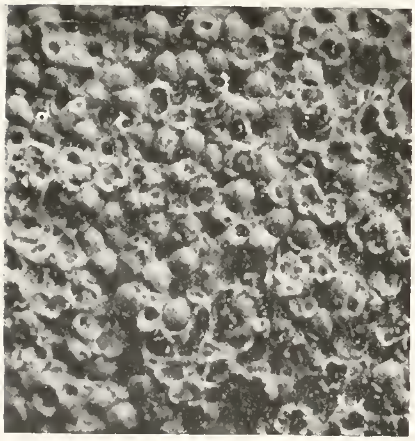
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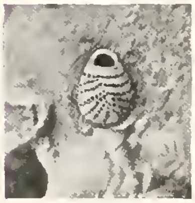
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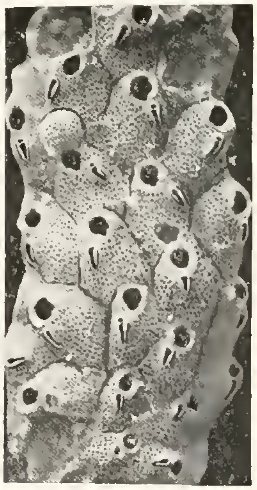
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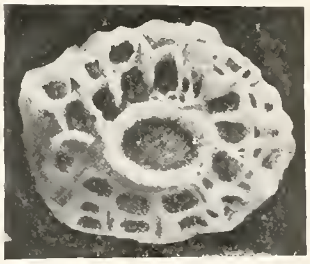
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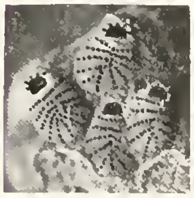
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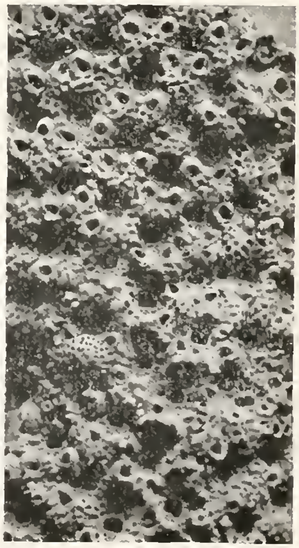
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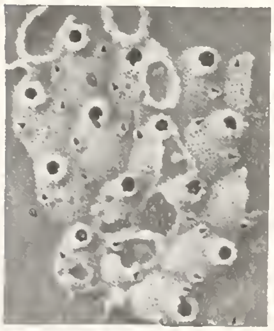
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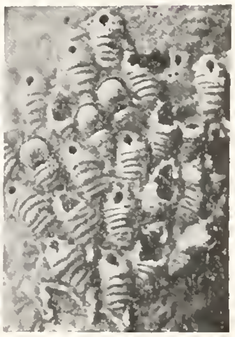
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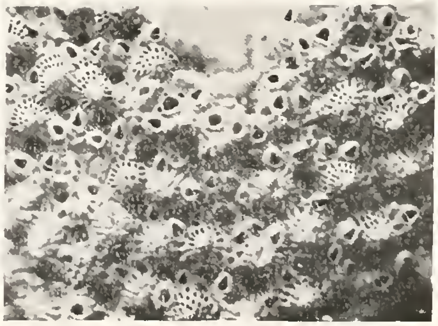
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 279.

PLATE 35.

FIG. 1. *Puellina radiata* forma *scripta* Reuss, 1847. (See also pl. 15, fig. 12.) (p. 89.)

Well-preserved zoarium, × 20, with elongated zooecia and well-developed avicularia and spines.

Pleistocene: Santa Barbara, California.

FIGS. 2, 3. *Puellina hermanni* Gabb and Horn, 1862. (p. 89.)

2. Several zooecia of the incrusting zoarium, × 20, showing the wide costules and the oral spines.

3. A single zooecium, × 20, illustrating the rectilinear proximal border of the apertura.

Pleistocene: Santa Barbara, California.

FIG. 4. *Metracolposa mucronata*, new species. (p. 92.)

The incrusting type specimen, × 20, showing the large keeled ovicell.

Pleistocene: Santa Barbara, California.

FIGS. 5–8. *Hippothoa hyalina* Linnaeus, 1768. (p. 92.)

5. Portion of a zoarium, × 20, illustrating the three kinds of zooecia.

Pleistocene: Santa Barbara, California.

6. A zoarium, × 20, formed almost entirely of ordinary zooecia and showing the ancestrula.

7. A small incrusting patch, × 20, with ordinary zooecia only.

8. A mature example, × 20, in which the irregular arrangement of the male zooecia gives a celleporoid effect.

Pleistocene: Dead Mans Island, off San Pedro, California.

FIG. 9. *Hippothoa hyalina*, var. *rugosa*, new variety. (p. 94.)

Type example, × 20, showing the characteristic frontal wrinkles.

Pleistocene: Santa Barbara, California.

FIG. 10. *Schizolavella vulgaris* Moll, 1803. (p. 108.)

The Pleistocene specimen referred to this species, × 20.

Pleistocene: Santa Barbara, California.

FIG. 11. *Schizomavella longirostrata* Hincks, 1883. (p. 109.)

A fossil example referred to this recent species, × 20. The large avicularium and the very small tremopores are shown.

Pleistocene: Santa Barbara, California.

FIGS. 12–14. *Trypematella papulifera*, new species. (p. 135.)

12. Surface of the unilamellar zoarium, × 20, showing unovicelled zooecia.

13. A zoarium, × 20, bearing ovicell.

14. Transverse section of the hollow tubular zoarium, × 20.

Pleistocene: Rustic Canyon, Santa Monica, California.

PLATE 36.

FIG. 1. *Lepralia cribrosa?* Maplestone, 1900. (p. 134.)

Surface of the specimen, × 20, referred to this Australian Miocene species.

Pleistocene: Rustic Canyon, Santa Monica, California.

FIGS. 2, 3. *Fenestrulina malusi* Savigny-Audouin, 1826. (p. 115.)

2. Photograph, × 20, showing small zooecia.

3. Zoarium, × 20, with large zooecia, some showing the ovicell.

Pleistocene: Santa Barbara, California.

FIGS. 4, 5. *Microporella ciliata* Linnaeus, 1759. (See also pl. 20, figs. 1–6.) (p. 119.)

4. Zoarium, × 20, exhibiting zooecia with small avicularia.

5. Zoarium, × 20, in which the zooecia have large avicularia.

Pleistocene: Santa Barbara, California.

FIGS. 6, 7. *Microporella umbonata* Hincks, 1882. (p. 123.)

6. Marginal zooecia without ovicell, × 20.

7. Ovicelled zooecia of the same specimen, × 20, exhibiting also the frontal umbo.

Pleistocene: Santa Barbara, California.

FIGS. 8–10. *Microporella californica* Hincks, 1883. (p. 123.)

8. Zooecia, × 20, showing only a single but well-developed avicularium.

9. Zoarium with ovicell zooecia, × 20, with a single avicularium.

Pleistocene: Long Wharf Canyon, Santa Monica, California.

10. Normal and ovicelled zooecia of a large expansion, × 20.

Pleistocene: Santa Barbara, California.

FIGS. 11, 12. *Microporella vibraculifera* Hincks, 1883. (p. 124.)

11. A zoarium, × 20, with ancestrular zooecia.

Pleistocene: Rustic Canyon, Santa Monica, California.

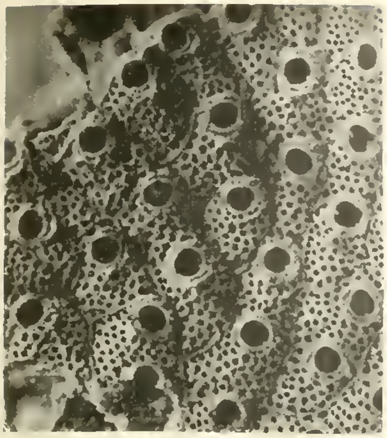
12. Ovicelled and normal zooecia, × 20, illustrating the avicularia and the six hollow spines.

Pleistocene: Santa Barbara, California.

FIG. 13. *Microporella customata* Gabb and Horn, 1862. (p. 124.)

Zoarial surface, × 20, with ovicelled and normal zooecia and with the avicularium oblique to the zooecial axis.

Pleistocene: Rustic Canyon, Santa Monica, California.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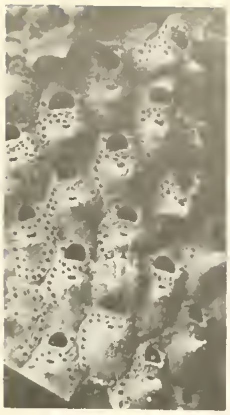
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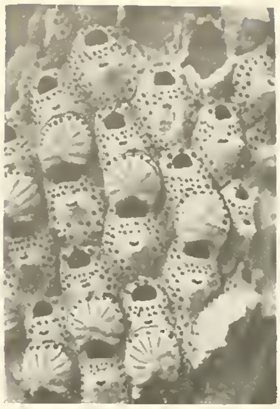
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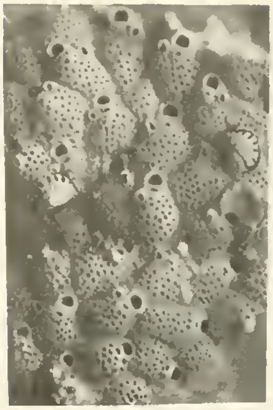
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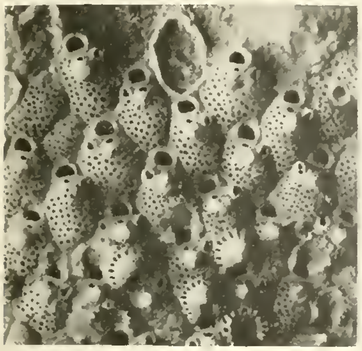
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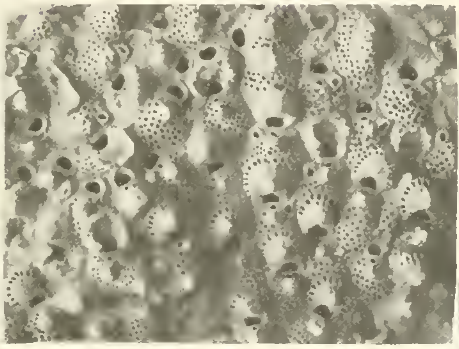
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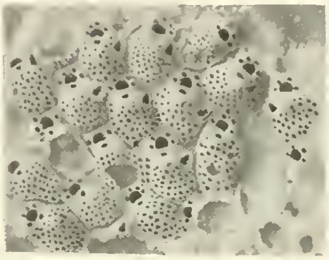
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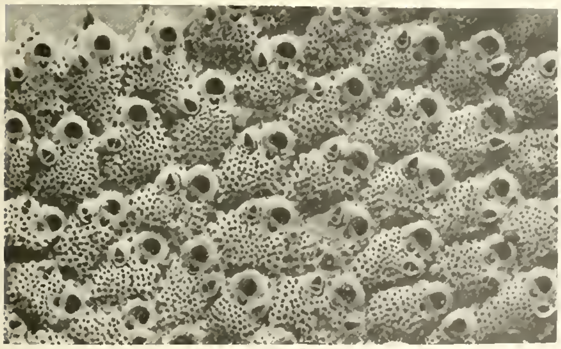
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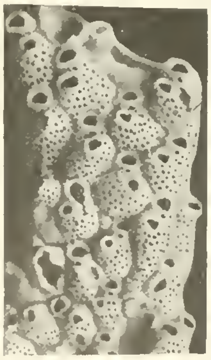
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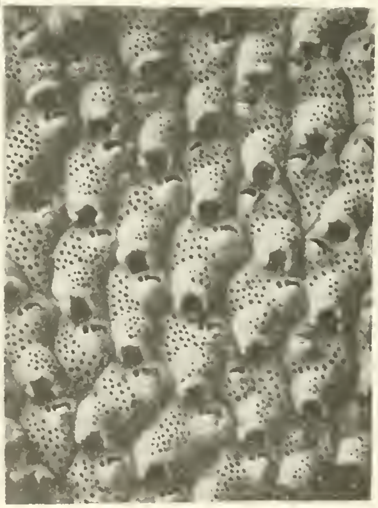
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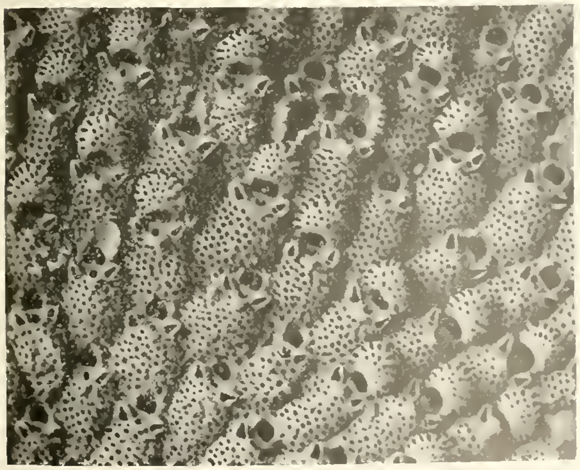
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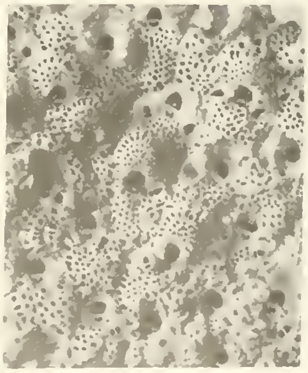
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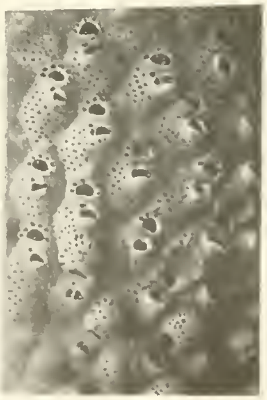
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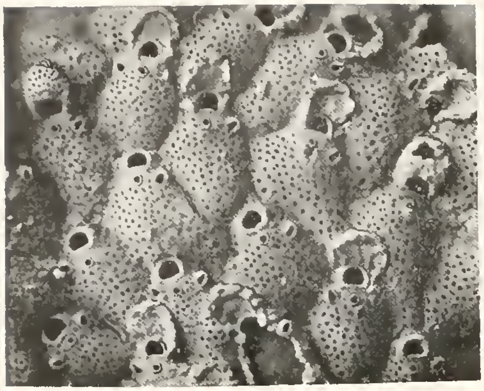
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 280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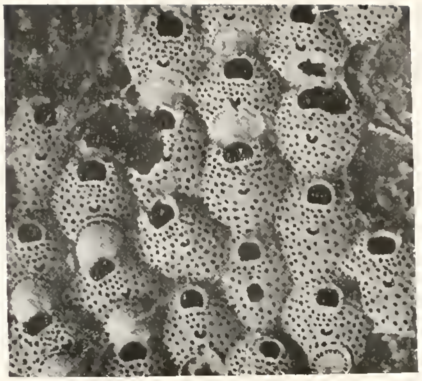
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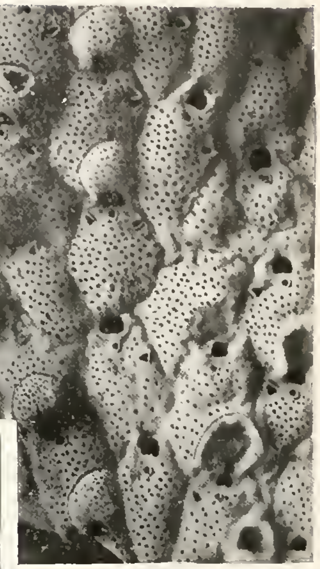
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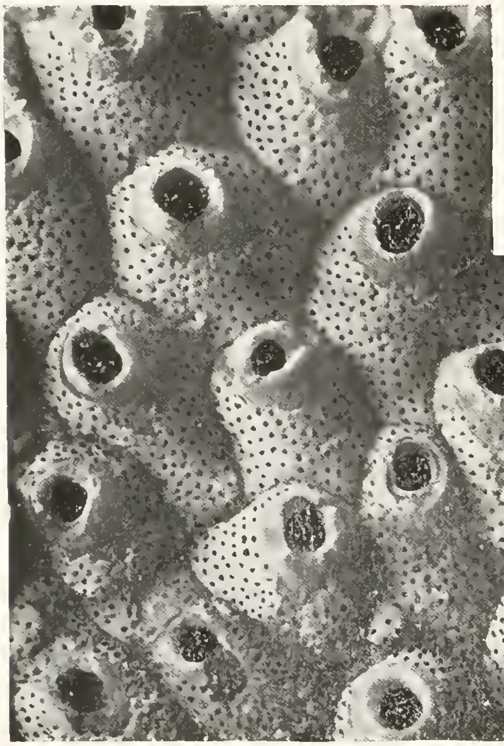
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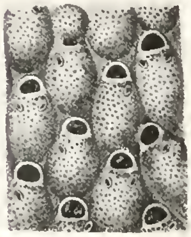
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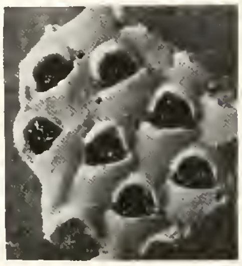
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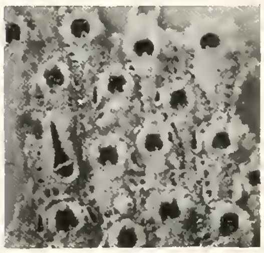
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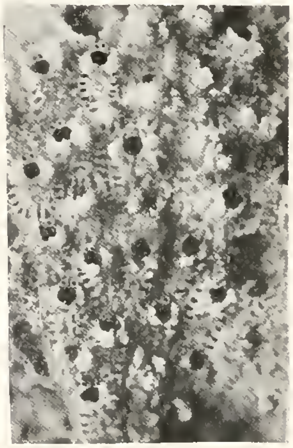
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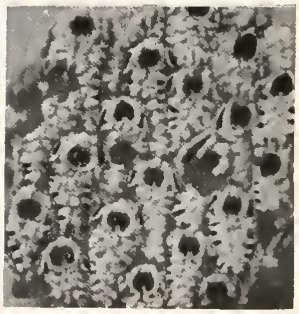
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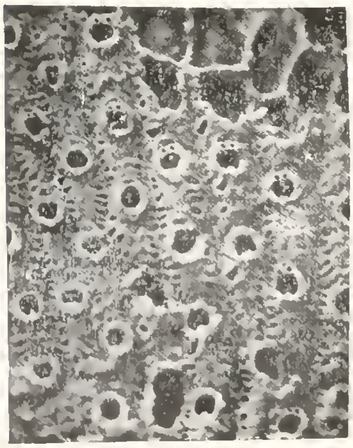
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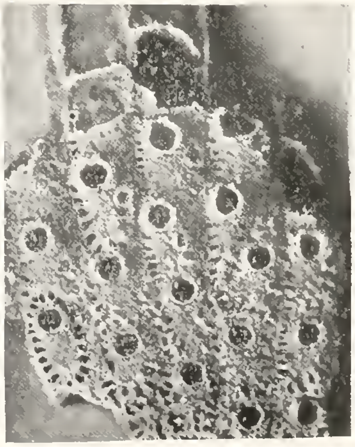
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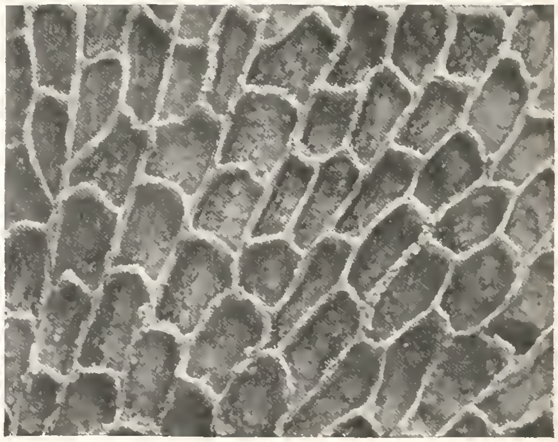
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 281.

PLATE 37.

FIGS. 1, 2. *Microporella heermani* Gabb and Horn, 1862. (p. 125.)

1. Ordinary and ovicelled zooecia, × 20. The large dimensions, granular frontal and small tremopores and avicularia are illustrated.

Pleistocene: Rustic Canyon, Santa Monica, California.

2. The original figure of the species.

Pleistocene: Santa Barbara, California.

FIG. 3. *Microporella gibbera*, new species. (p. 126.)

Surface of the unilamellar zoarium, × 20, showing the distinct, irregular, gibbose zooecia.

Pleistocene: Rustic Canyon, Santa Monica, California.

FIG. 4. *Fenestrulina porosa*, new species. (p. 117.)

Surface of the incrusting zoarium, × 20.

Pleistocene: Long Wharf Canyon, Santa Monica, California.

FIG. 5. *Cyclicopora gigantea*, new species. (p. 139.)

Surface of the incrusting zoarium, × 20, showing the extreme size of the zooecia.

Pleistocene: Tremochal Canyon, Santa Monica, California.

FIG. 6. *Eurystomella bilabiata* Hincks, 1884. (p. 142.)

A fossil specimen, × 20, referred to this interesting recent species.

Pleistocene: Dead Mans Island, off San Pedro, California.

FIGS. 7–9. *Smittina californiensis* Robertson, 1908. (p. 146.)

7. Zooecia, × 20, showing thin areolar costules and the peristome formed by two lateral tuberosities.

8. Another example, × 20, with two small lateral avicularia and a large interzooecial avicularium developed.

9. Surface of zooecia, × 20, with the two small avicularia, one of which has the beak directed upward and the other downward.

Pleistocene: Santa Barbara, California.

FIGS. 10–12. *Smittina grandicella*, new species. (p. 145.)

10. The incrusting zoarium, × 20, showing the large distinct zooecia and the distal pores in the peristome.

11. Another example, × 20, not so well preserved.

12. A zoarium, × 20, with the frontal removed, illustrating the sinuous arrangement of the walls, which are without septulae.

Pleistocene: Rustic Canyon, Santa Monica, California.

PLATE 38.

FIGS. 1–7. *Smittina discoidea*, new species. (p. 145.)

1. Fragments of the unilamellar zoarium, natural size.
2. Surface, × 20, showing the large interzooecial avicularium.
3. Zooecial surface, × 20, with the large avicularium replaced by two small ones. Ovicelled zooecia are present.
4. Lower side, × 20.
5. Another surface, × 20, in which the large avicularium is unguiculate.
6. Zooecia, × 20, with the large avicularia turned in different directions.
7. Interior of zooecia, × 20, showing that the lyrula is accompanied by two cardelles.

Pleistocene: Rustic Canyon, Santa Monica, California.

FIG. 8. *Cystisella aviculifera*, new species. (p. 152.)

Portion of the incrusting zoarium, × 20, showing the small ancestrular zooecia and the large marginal ones.

Pleistocene: Santa Barbara, California.

FIG. 9. *Smittina porifera* Hincks, 1884. (p. 147.)

Zooecia of the incrusting zoarium, × 20, showing the convex frontal perforated by pores.

Pleistocene: Santa Monica, California.

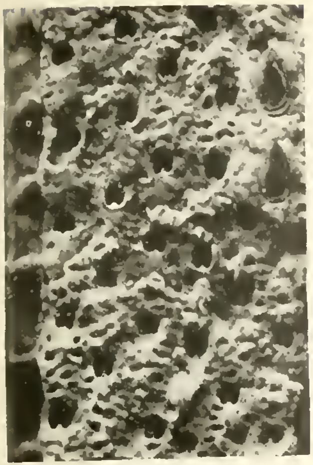
FIGS. 10–15. *Porella collifera* Robertson, 1908. (p. 148.)

10. Zoaria, natural size.
11. Ovicelled zooecia, × 20.
12. Surface, × 20, with one zooecium bearing a small ovicell.
13. Zooecia, × 20, with a very salient peristome.

Pleistocene: Santa Monica, California.

14. Zooecia, × 20, with large tremopores.
15. Interior of zooecia, × 20. The oral avicularium is supported by a denticulated lyrula.

Pleistocene: Santa Barbara, California.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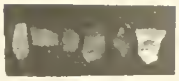
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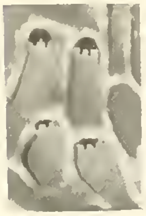
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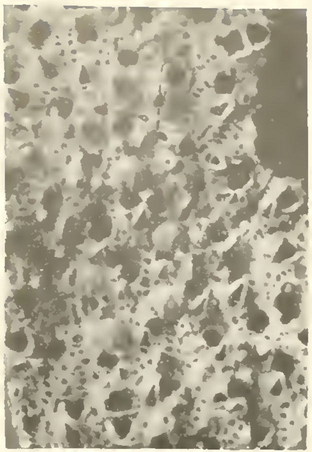
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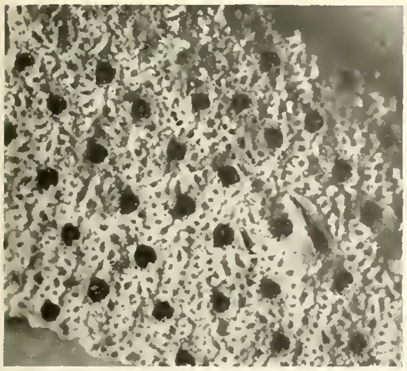
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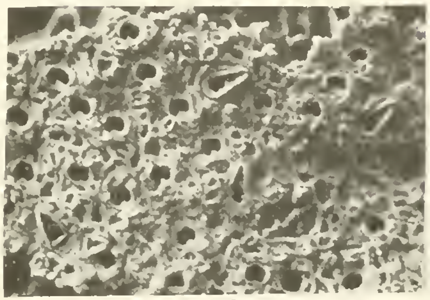
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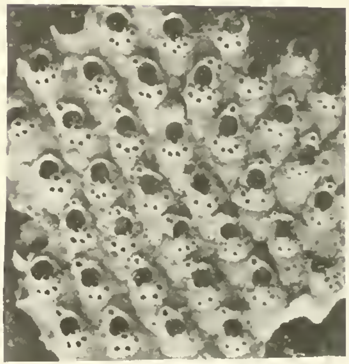
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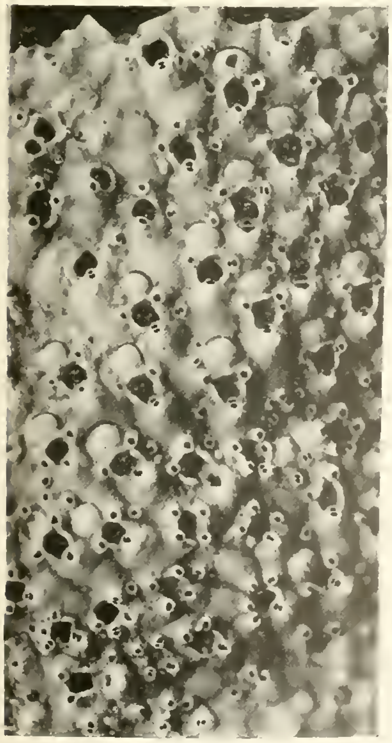
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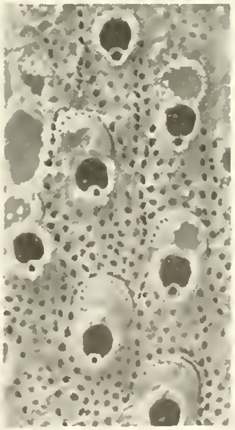
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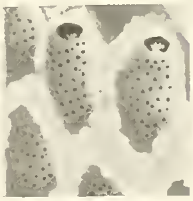
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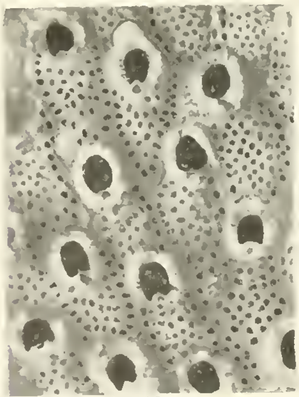
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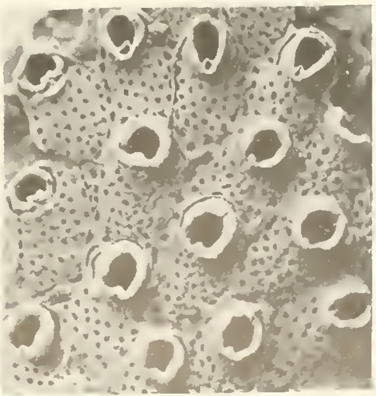
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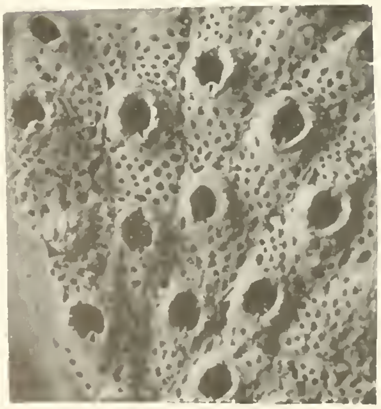
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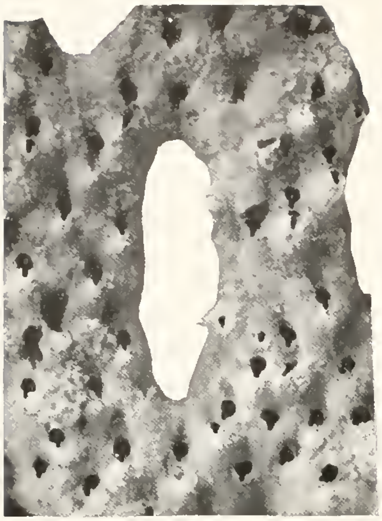
NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 2[illegible]2.



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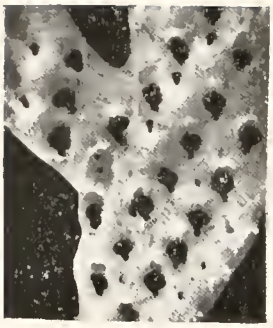

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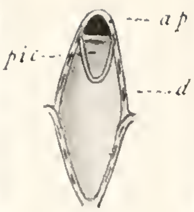

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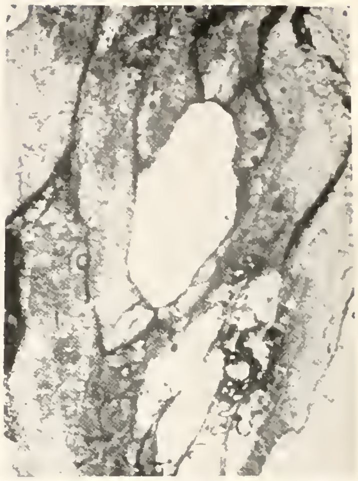

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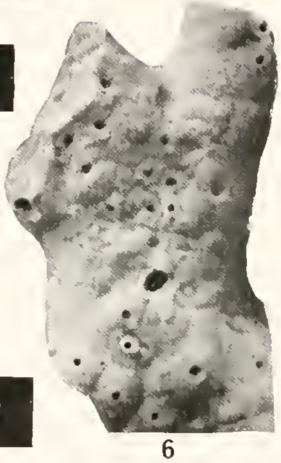

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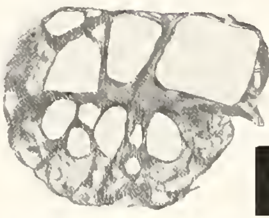

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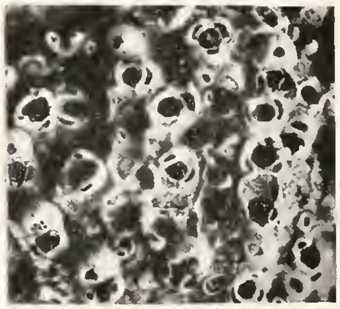

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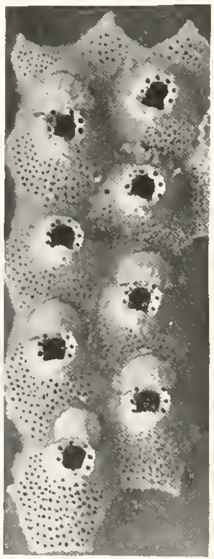

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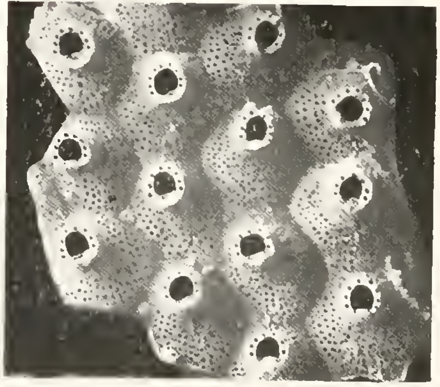

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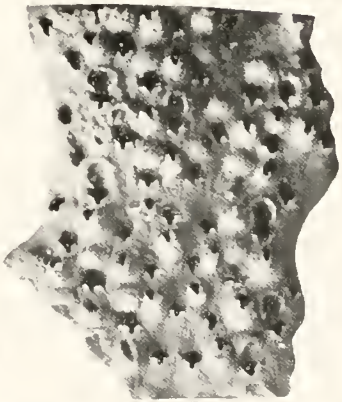

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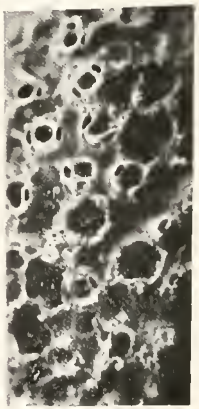

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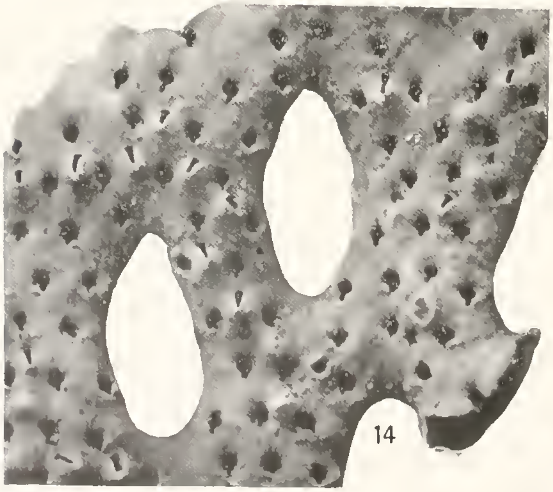

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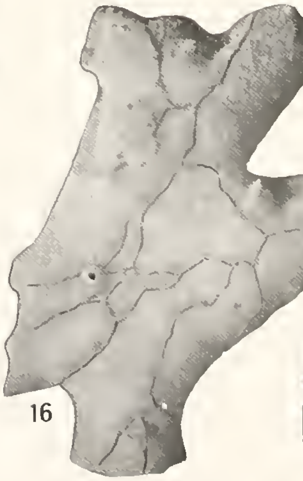

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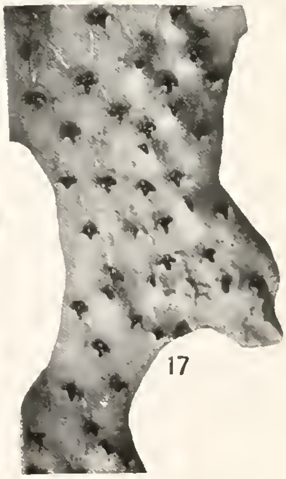

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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 283.

PLATE 39.

FIGS. 1–7. *Phidolopora pacifica* Robertson 1908. (p. 154.)

1. Zoarial fragments, natural size.
2. Celluliferous side of fragment, × 20, with the frontal avicularium well developed.
3. Another fragment, × 20, in which the frontal avicularium is absent or worn away.
4. Tangential thin section of the dorsal, × 25, illustrating the special calcification of the vibices.
5. View of the interior of the zooecia, × 20. *ap*, apertura; *pic*, peristomie; *d*, dietellae.
6. Dorsal side of zoarium, × 20, showing some radicular pores and an avicularium.
7. Transverse thin section, × 25.

Pleistocene: Rustic Canyon, Santa Monica, California.

FIGS. 8, 9. *Phylactella spinosissima*, var. *major* Hincks, 1884. (p. 170.)

8. Zooecia of the incrusting zoarium, × 20, showing the recumbent ovicell.
9. A specimen, × 20, with zooecia exhibiting the spines, oral mucro, and the tremopores.

Pleistocene: Long Wharf Canyon, Santa Monica, California.

FIGS. 10–12. *Costazzia robertsoniae*, new species. (p. 181.)

10. Zoaria, natural size.
11. Surface of the globular zoarium, × 20, with ovicelled zooecia and interzooecial avicularia.
12. Another surface, × 20, showing incomplete zooecia.

Pleistocene: Rustic Canyon, Santa Monica, California.

FIGS. 13–17. *Phidolopora labiata* Gabb and Horn, 1862. (p. 154.)

13. The reticulated zoarium, natural size.
14. Celluliferous surface, ×20, showing zooecia with large salient avicularia.
15. A fragment, × 20, with ovicelled zooecia.
16. Dorsal side of a fragment, × 20, illustrating the irregular vibices.
17. Another fragment, × 20, with the zooecia distinctly outlined by a salient thread.

Pleistocene: Santa Barbara, California.

PLATE 40.

FIGS. 1–4. *Tubucellaria punctulata* Gabb and Horn, 1862. (p. 170.)

1. Zoarial fragments, natural size.

2. A ramified segment, × 20.

3. Another segment, × 20, illustrating the zooecial surface.

4. Longitudinal section, × 20.

Pleistocene: Santa Barbara, California.

FIGS. 5, 6. *Tubucellaria punctulata*, var. *minor*, new variety. (p. 170.)

A fragment natural size, and surface of the same, × 20. The smaller size of the zooecia and tremopores is evident.

Pleistocene: Santa Barbara, California.

FIG. 7. *Lagenipora spinulosa* Hincks, 1884. (p. 171.)

An example, × 20, much changed by fossilization.

Pleistocene: Dead Mans Island, off San Pedro, California.

FIGS. 8, 9. *Holoporella umbonata*, new species. (p. 178.)

8. Zooecial surface, × 20, illustrating the areolar pores.

9. Well-developed example with interareolar costules radiating from the umbo. Several ovicelled zooecia are present.

Pleistocene: Santa Barbara, California.

FIGS. 10, 11. *Schismopora abrupta*, new species. (p. 180.)

10. Surface of the incrusting zoarium, × 20, with some of the usual small avicularia transformed into very long ones.

11. Another surface, × 20. The transverse, smooth, deeply embedded ovicell and the numerous small triangular avicularia are quite visible.

Pleistocene: Santa Barbara, California.

FIGS. 12–15. *Schismopora lanceolata*, new species. (p. 181.)

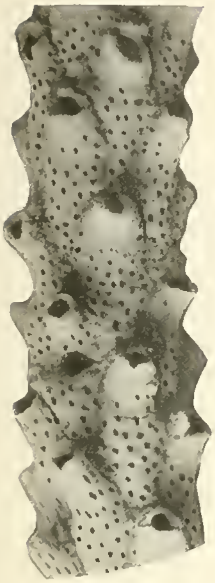
12. The small lamellar zoarial masses, natural size.

13. Surface, × 20, illustrating the triangular sinus of the apertura and the lanceolate interzooecial avicularia.

14. Ovicelled zooecia, × 20. The characteristic avicularia are also present.

15. Portion of the zooecial surface, × 20, showing the incomplete zooecia.

Pleistocene: Santa Monica, California.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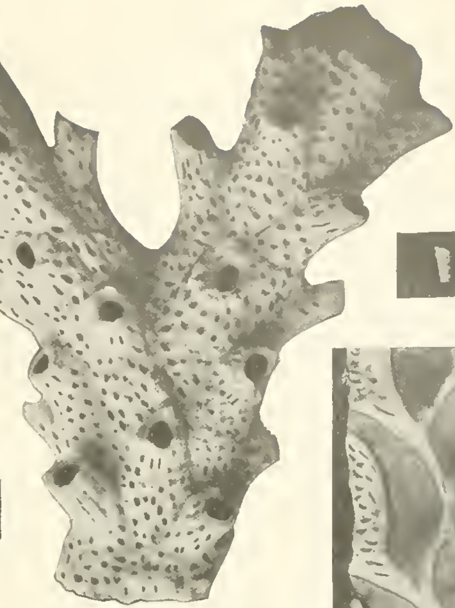
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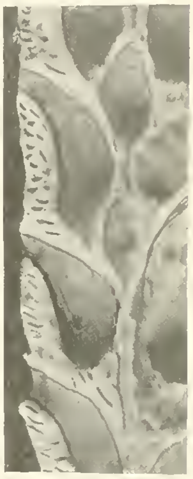
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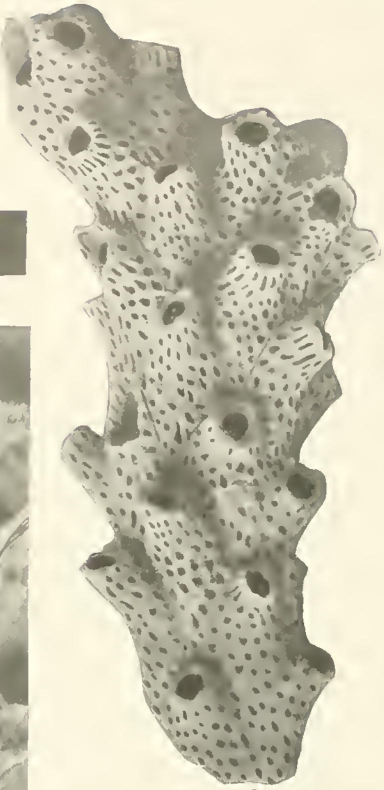
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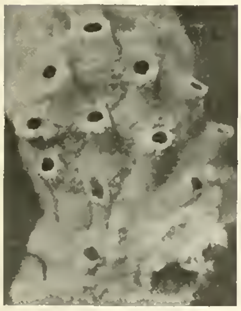
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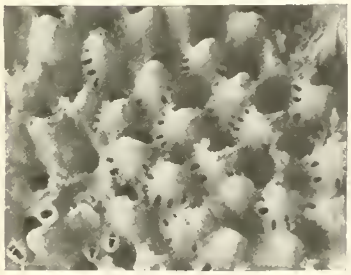
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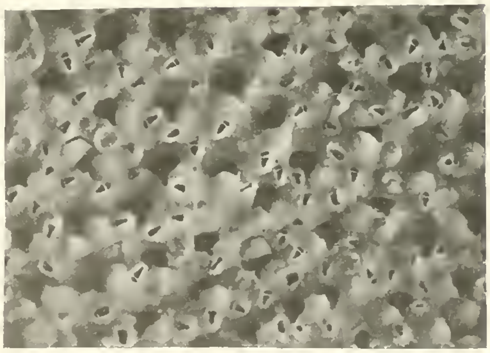
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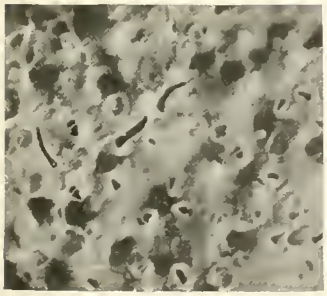
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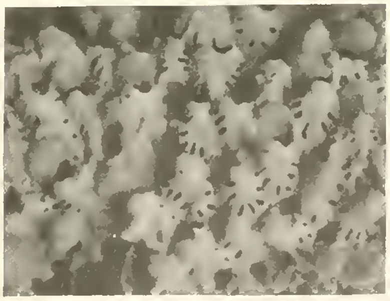
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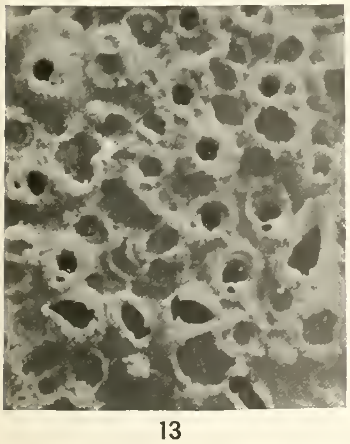
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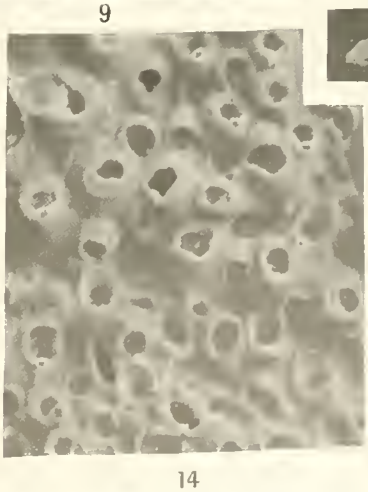
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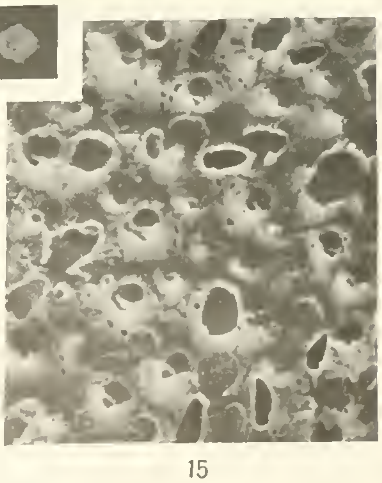
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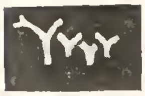
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 284.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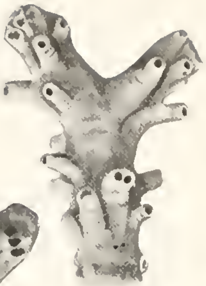
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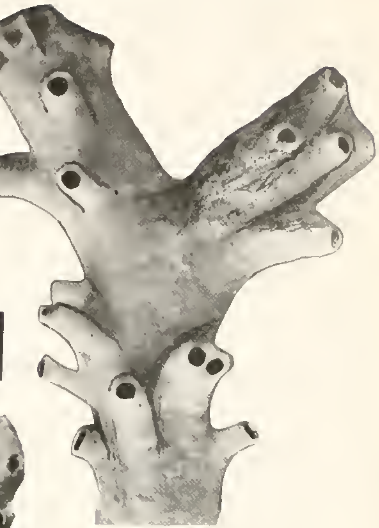
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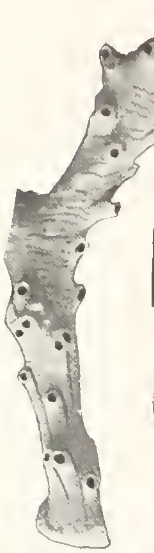
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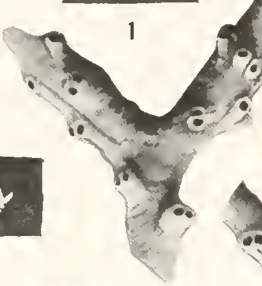
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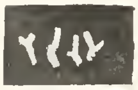
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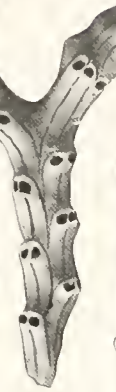
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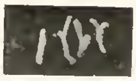
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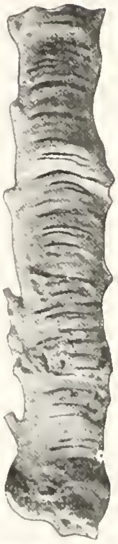
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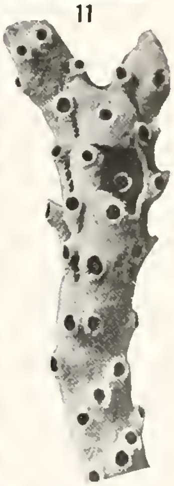
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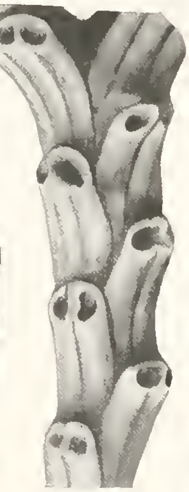
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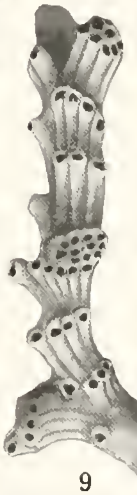
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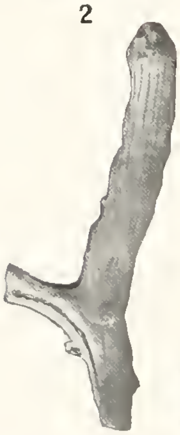
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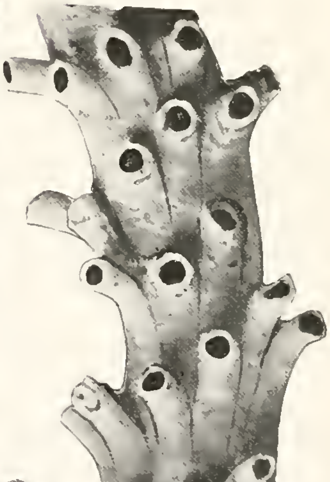
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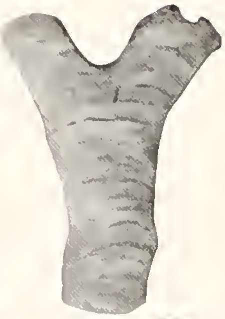
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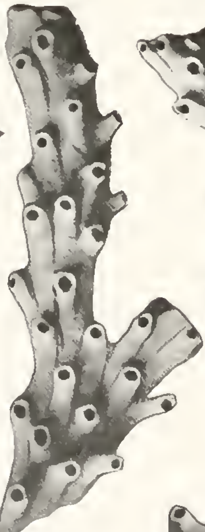
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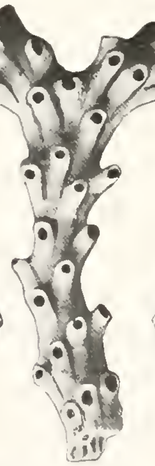
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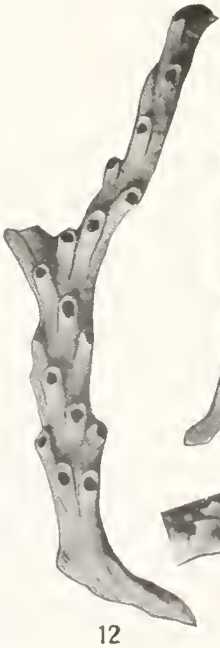
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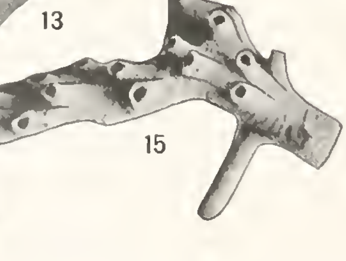
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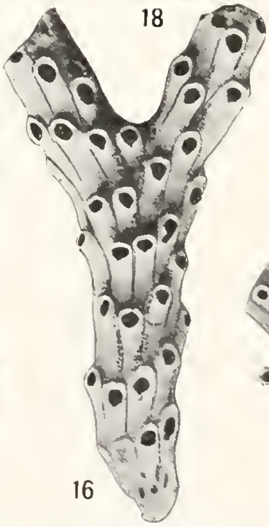
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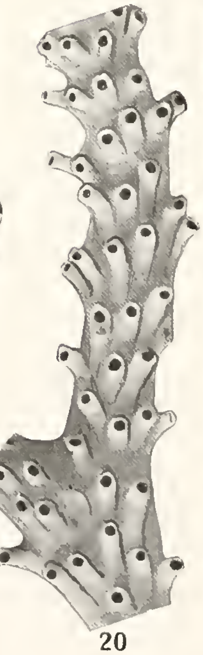
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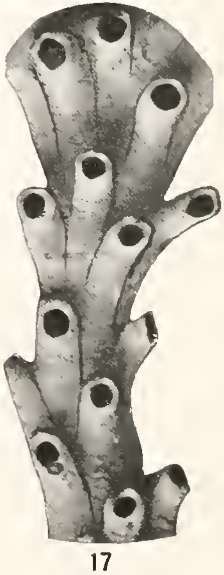
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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 285.

PLATE 41.

FIGS. 1–5. *Entalophora fasciculifera*, new species. (p. 195.)

1. Zoarial fragments, natural size.
2. A large example, × 12, with tubes little salient.
3. A fragment, × 12, showing three fascicles of two zooecia each.
4, 5. An example with long peristomes, × 12, and a portion of the same, × 25.

Pleistocene: Tremochal Canyon, Santa Monica, California.

FIGS. 6–10. *Idmonea dispar*, new species. (p. 198.)

6. Fragments, natural size.
7. Anterior (cellular) face, × 12.
8. Posterior side showing longitudinal striations, × 12.
9. Lateral view of a fragment, × 12, bearing a small branch.
10. A portion of figure 7, × 25.

Pleistocene: Rustic Canyon, Santa Monica, California.

FIGS. 11–19. *Filisparsa clarki*, new species. (p. 195.)

11. Fragments of the zoarium, natural size.
12–14. Three examples, × 12, showing different aspects of the anterior face.
15. A specimen with a dorsal apophysis, × 12.
16. An example, × 12, in which the peristomes are grouped in transverse and oblique rows.
17. Portion of a zoarium, × 25.
18. Posterior side, × 12.
19. An ovicelled example, × 12.

Pleistocene: Santa Barbara, California.

FIGS. 20–22. *Filisparsa clarki*, var. *parvula*, new variety. (p. 196.)

20, 21. Anterior side of the zoarium, × 12 and × 25, showing the slightly smaller dimensions.
22. Posterior side, × 12, illustrating transverse wrinkling.

Pleistocene: Santa Barbara, California.

PLATE 42.

FIGS. 1–7. *Crisia serrata* Gabb and Horn, 1862. (p. 196.)

1. Zoarial segments, natural size.
2. Characteristic segment, × 12.
3. Noncelluliferous side of a segment, × 25, with two ramal bases.
4. Another segment, × 25, with two ramal bases. Some of the apertures are closed by lamellae.
5. Another segment, × 25.
6. A segment, × 25, showing the characteristic median carina and but a single ramal base.

Pleistocene: Rustic Canyon, Santa Monica, California.

7. Portion of an ovicelled segment, × 25.

Pleistocene: Santa Barbara, California.

FIG. 8. *Crisia*, species.

Several segments, × 12, still united by their corneous joints, which have not been destroyed by fossilization.

Pleistocene: Rustic Canyon, Santa Monica, California.

FIGS. 9–17. *Tubulipora fasciculifera* Hincks, 1884. (p. 197.)

9–11. Three zoaria, × 12, illustrating variations in form.

12. An example, × 12, showing a small lateral ovicell.

13. Another ovicelled example, × 12, illustrating the large oeciostome at the beginning of a fascicle.

14, 15. Two unovicelled zoaria, × 12, with short fascicles.

16. Several zoaria, natural size.

17. Fragment of a zoarium, × 25.

Pleistocene: Santa Barbara, California.

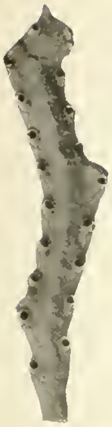
FIGS. 18–23. *Tubulipora tuba* Gabb and Horn, 1862. (p. 198.)

18. Zoarium, natural size.
19. A young ovicelled specimen with short fascicles, × 12.
20. An ovicelled example with a long capillary oeciostome, × 12.
21. Surface of the same, × 25, illustrating the ovicell and oeciostome.

Pleistocene: Rustic Canyon, Santa Monica, California.

22. An idmoneiform ovicelled specimen, × 12, with long fascicles.
23. An irregular flabellate specimen, × 12.

Pleistocene: Santa Barbara, California.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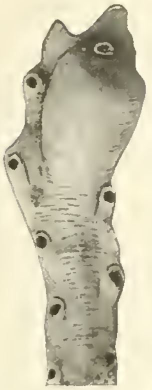
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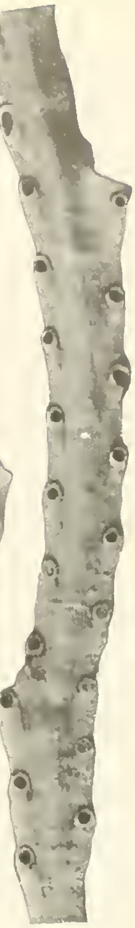
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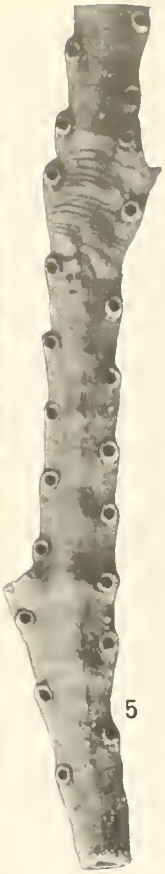
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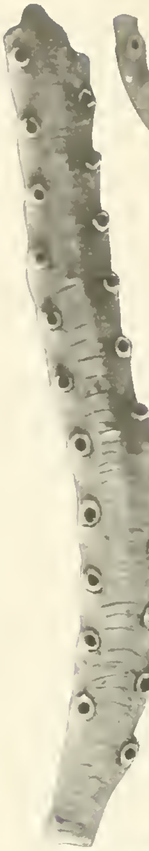
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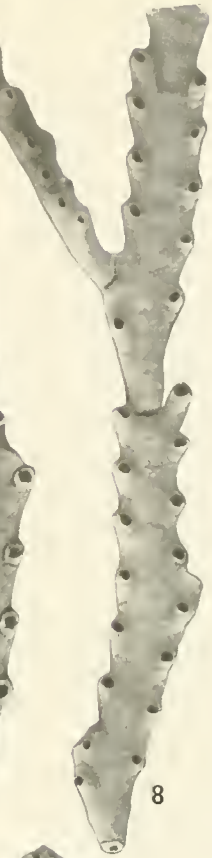
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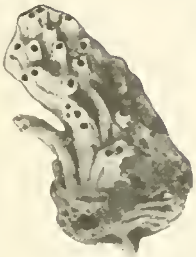
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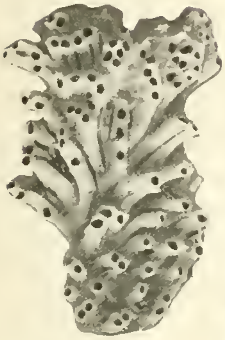
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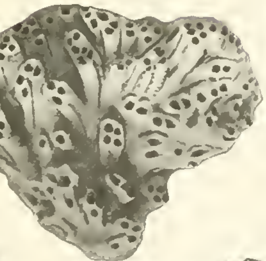
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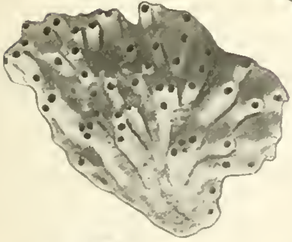
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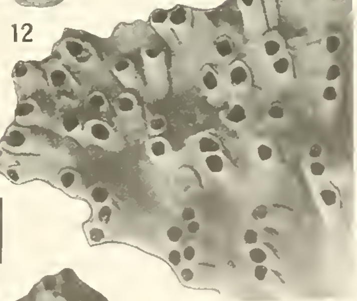
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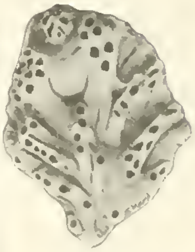
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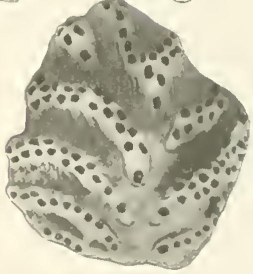
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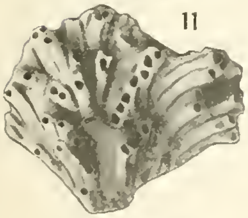
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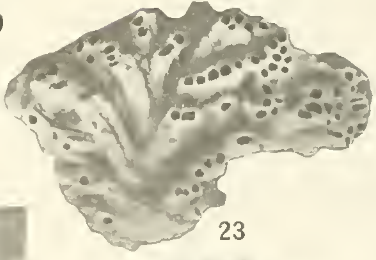
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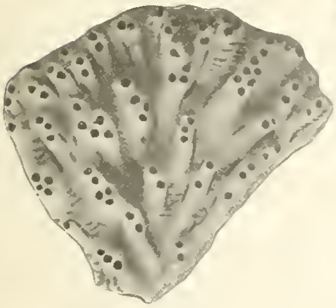
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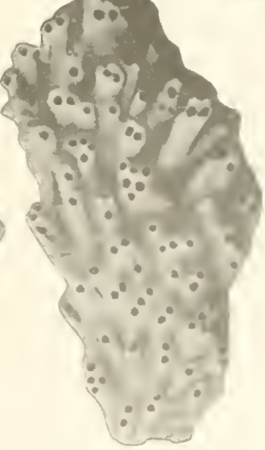
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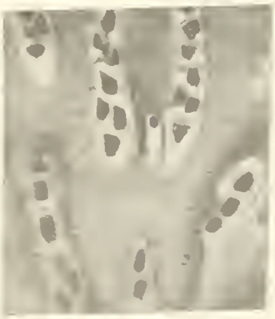
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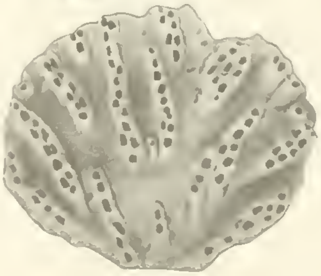
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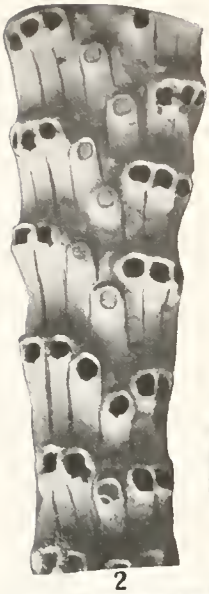
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 286.



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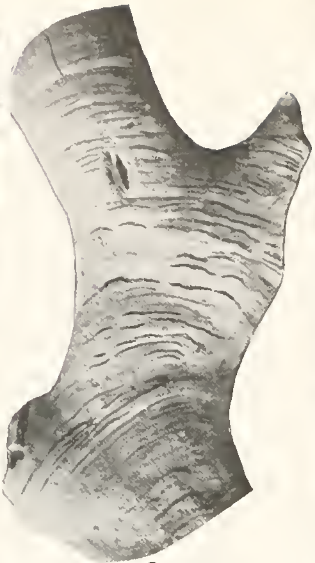

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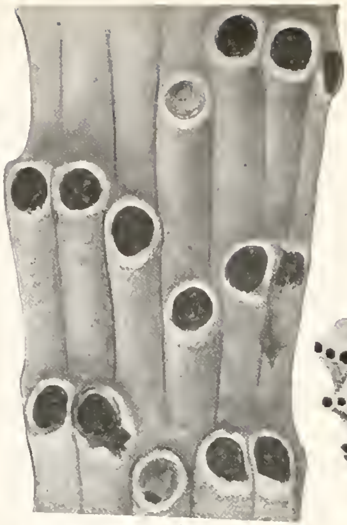

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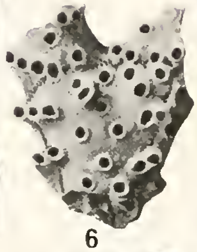

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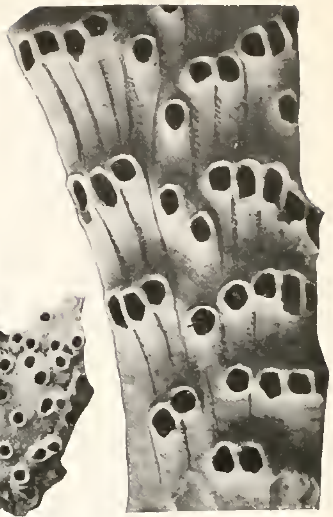

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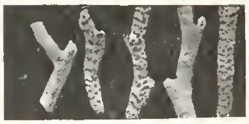

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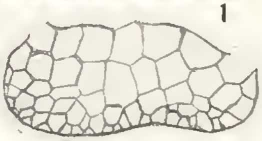

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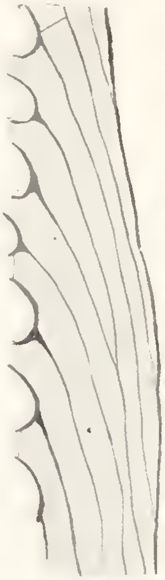

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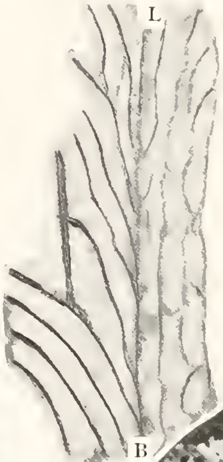

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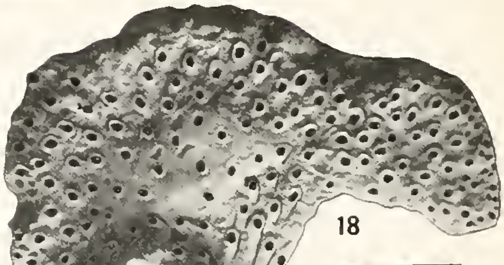

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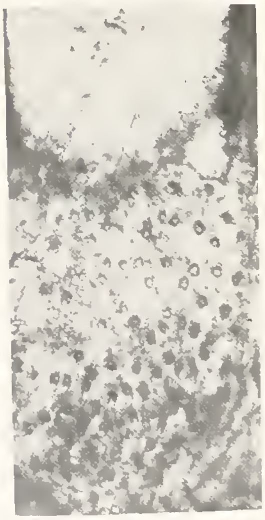

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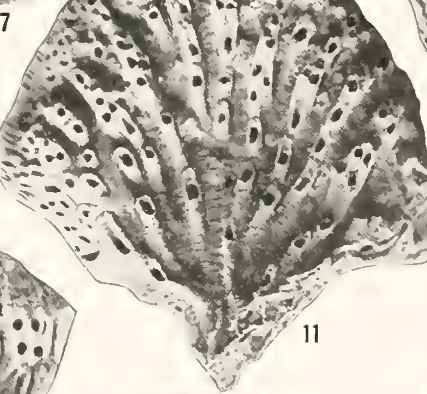

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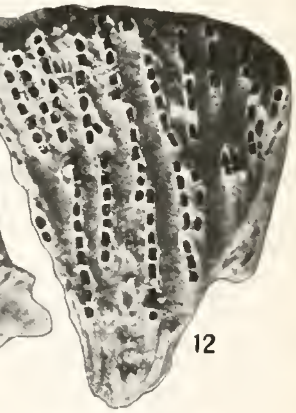

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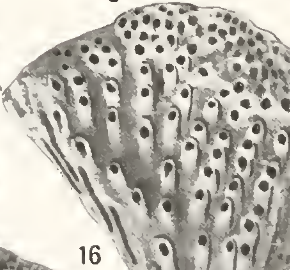

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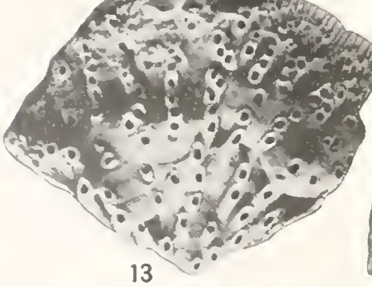

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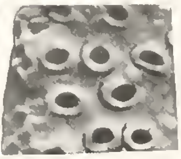

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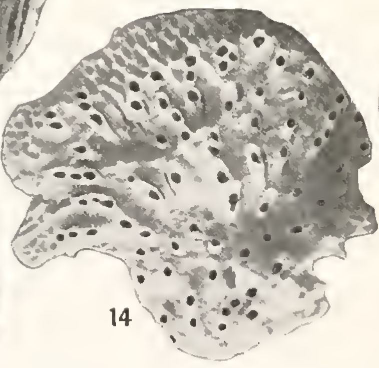

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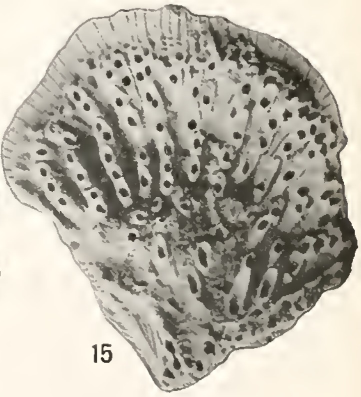

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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 287.

PLATE 43.

FIGS. 1–9. *Idmonea californica* D'Orbigny, 1852. (p. 199.)

1. Zoarial fragments, natural size.
2. Celluliferous side, × 12, showing the axial zooecia isolated and closed by a diaphragm.
3. Posterior side, × 12, illustrating the transverse striations.
4. Another example, × 12, in which the axial zooecia are open.
5. A portion of figure 2, × 25.
6. An ovicelled specimen, × 6.
7. Transverse thin section, × 12. The tubes are polygonal.
8. Longitudinal thin section, × 12.
9. Tangential thin section, × 100. The mural perforations are no larger than in smaller species of the genus.

Pleistocene: Santa Barbara, California.

FIGS. 10–17. *Stathmepora flabellata*, new species. (p. 201.)

10. Zoarial fragments, natural size.
11. A rather complete flabellate specimen, × 12, with incomplete fascicles.
12. A fragment, × 12, showing bifurcated fascicles.
13. A specimen with large ovicell, × 12.
14. An example with broken ovicell, × 12, illustrating that the peristomes are here adjacent in the fascicles.
15. An ovicelled example, × 12, with a large basal lamella.

Pleistocene: Santa Barbara, California.

16. A flabellate example, × 12, with a thick zone of growth.
17. Longitudinal section, × 25. The tubes are cylindrical with triparietal gemmation. *L. B.*= basal lamella.

Pleistocene: Rustic Canyon, Santa Monica, California.

FIGS. 18, 19. *Diaperoecia flabellata*, new species. (p. 202.)

18. The flabellate bilamellar zoarium, × 12, with an ovicell developed.
19. Portion of the same, × 25.

Plesitocene: Rustic Canyon, Santa Monica, California.

Plate 44.

Figs. 1–3. *Lichenopora hispida* Fleming, 1828. (p. 203.)

1. Several zoaria, natural size.

2. An example, × 12, illustrating that the fascicles do not reach the zoarial margin.

3. An ovicelled example, × 12, with the ovicell not entirely covered by the cancelli and showing no oeciopore.

Pleistocene: Santa Barbara, California.

Figs. 4–7. *Lichenopora californica* Conrad, 1855. (p. 203.)

4. Zoaria, natural size.

5. An ovicelled example, × 12. The oeciostome is located between two fascicles.

6. Another ovicelled example, × 12, showing clearly the salient oeciostome and the ovicell covered with cancelli.

7. Inferior side of a discoid, free example, × 12.

Pleistocene: Santa Barbara, California.

Figs. 8–9. *Lichenopora verrucaria* Fabricius, 1780. (p. 205.)

Celluliferous surfaces of two ovicelled examples, × 12, referred to this recent species.

Pleistocene: Rustic Canyon, Santa Monica, California.

Fig. 10. *Lichenopora radiata* Savigny-Andouin, 1826. (p. 204.)

An incomplete although typical zoarium of this wide spread recent species, × 12. The cancelli are larger than the zooecial orifices.

Pleistocene: Rustic Canyon, Santa Monica, California.

Figs. 11–21. *Psilosolen capitiferax*, Canu and Bassler, 1922. (p. 207.)

11. A longitudinal thin section, × 25.

12. A longitudinal section showing the ovicell at the end of the branch, × 12.

13. Longitudinal thin section through a bifurcated branch, × 25. The tubes are cylindrical and ramify at all heights.

14, 15. Transverse thin sections, × 25.

16. An example, × 12, illustrating the irregular quincunx arrangement of the peristomes.

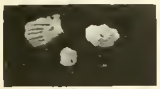
17. An example, × 12, with the peristomes arranged in zones.

18. A portion of the same zoarial surface, × 25, illustrating that the tubes are visible and the peristome thin.

19. An ordinary transverse section, × 25.

20, 21. Ovicelled specimens, × 12, illustrating the position of the ovicell at the flattened end of the branch.

Pleistocene: Santa Barbara, California.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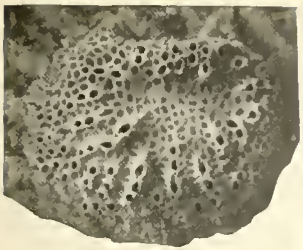
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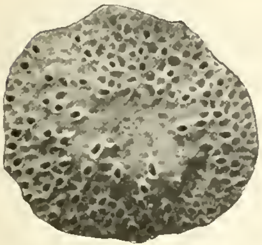
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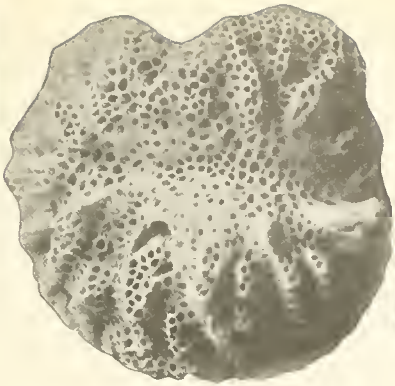
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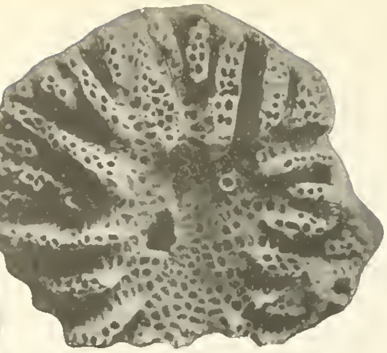
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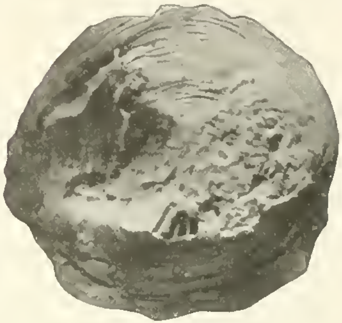
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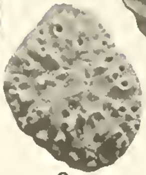
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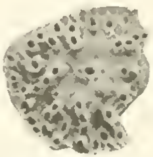
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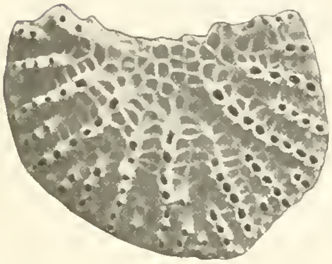
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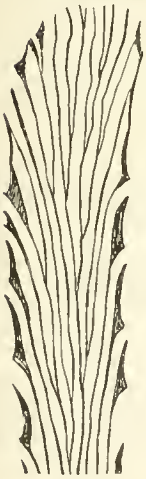
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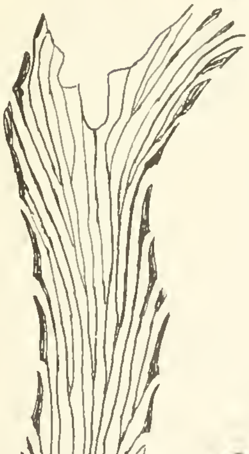
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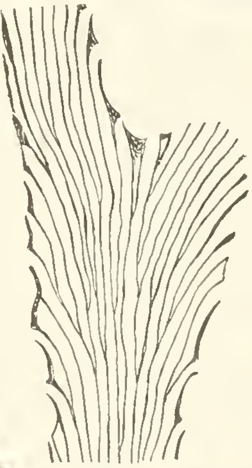
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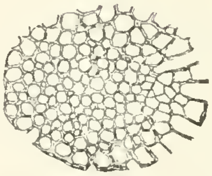
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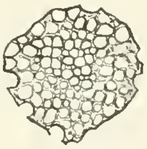
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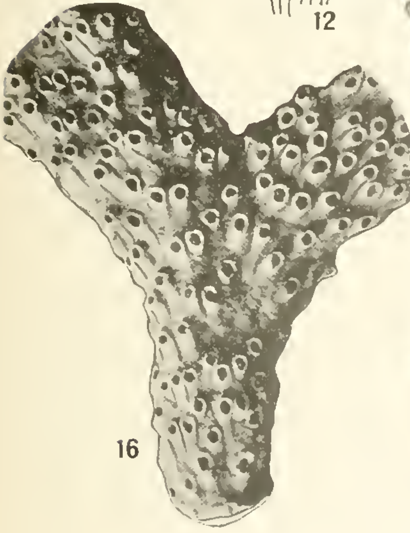
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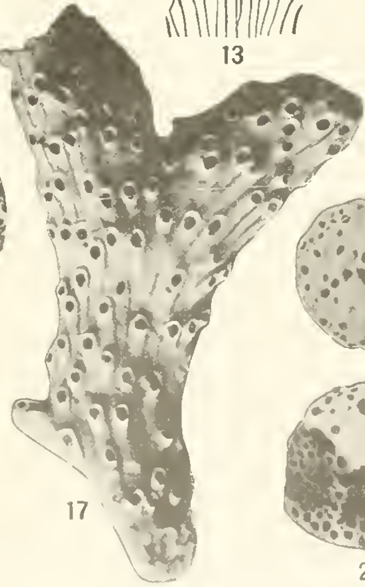
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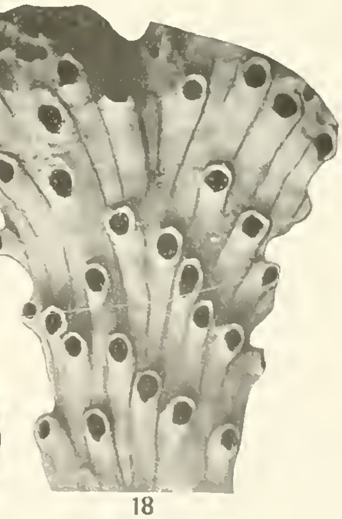
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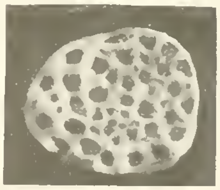
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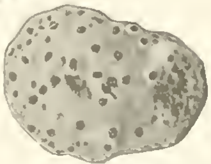
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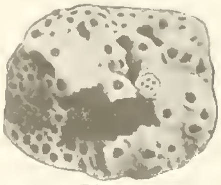
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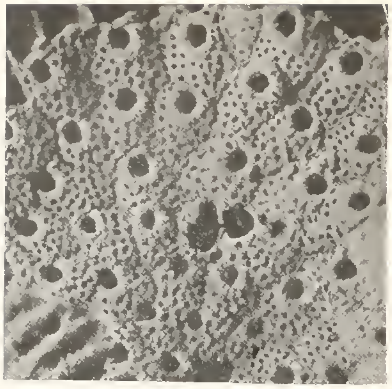
NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 288.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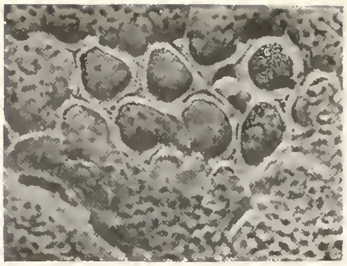
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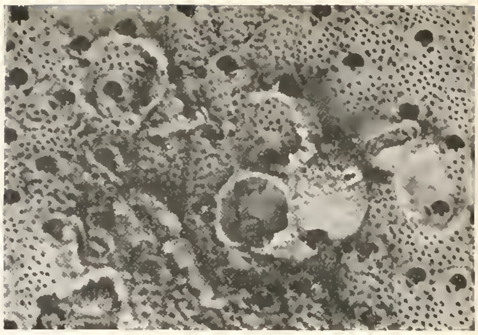
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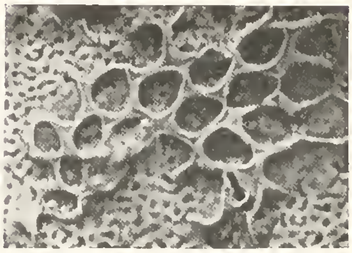
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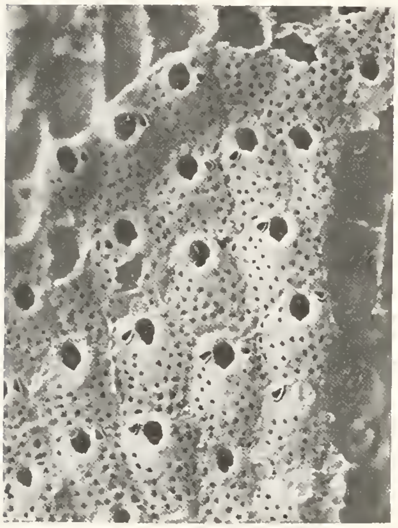
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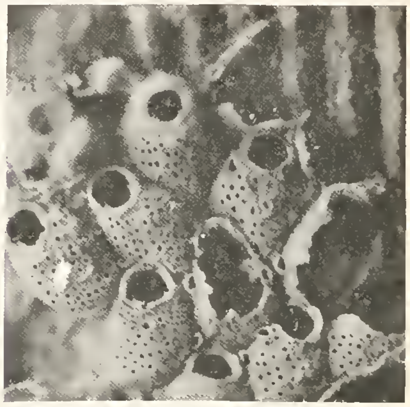
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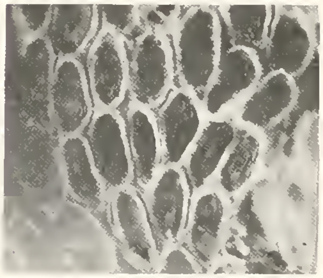
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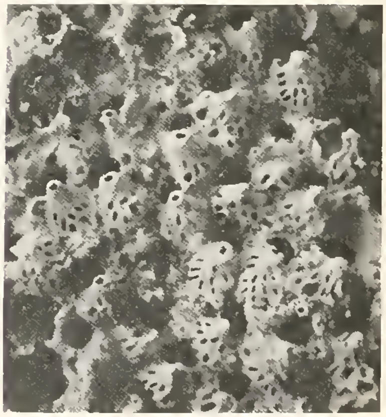
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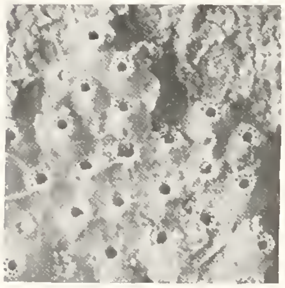
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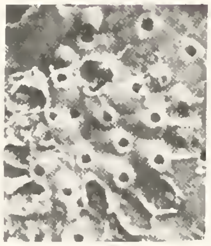
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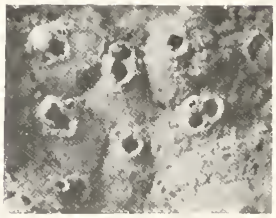
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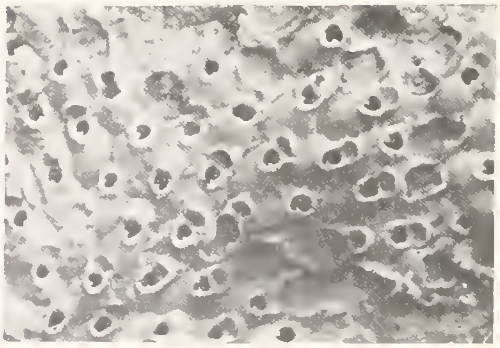
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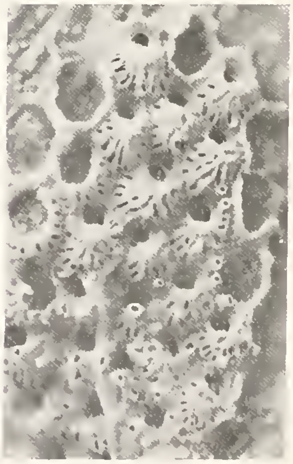
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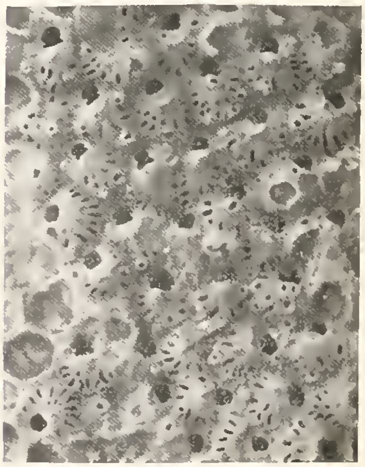
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NORTH AMERICAN LATER TERTIARY AND QUATERNARY BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 289.

PLATE 45.

FIGS. 1, 2. *Schizoporella magniporosa*, new species. (p. 95.)

1. View of the incrusting zoarium, × 20, showing the hexagonal zooecia with large tremopores.

2. Ancestrular portion of a zoarium, × 20. The aperture of the ancestrula is very large.

Pleistocene: Mount Hope, Panama Canal Zone.

FIGS. 3, 4. *Callopora guernei* Jullien, 1903. (p. 42.)

3. Several marginal zooecia, × 20, of a zoarium incrusting a coral.

4. Zooecia, × 20, in the vicinity of the ancestrula and exhibiting an avicularium.

Pleistocene: Mount Hope, Panama Canal Zone.

FIG. 5. *Callopora filum* Jullien, 1903. (p. 42.)

Zooecia, × 20.

Pleistocene: Mount Hope, Panama Canal Zone.

FIG. 6. *Stylopoma projecta*, new species. (p. 103.)

Zooecia, × 20, of the incrusting zoarium, exhibiting the ovicell and the small oral avicularium characteristic of the species.

Pleistocene: Mount Hope, Panama Canal Zone.

FIG. 7. *Dakaria chevreuxi* Jullien, 1903. (p. 97.)

Zooecia, × 20.

Pleistocene: Mount Hope, Panama Canal Zone.

FIGS. 8, 9. *Hippoporina pusilla*, new species. (p. 129.)

8. The incrusting zoarium, × 20, with ovicelled and badly oriented zooecia.

9. Zoarium, × 20, showing the ancestrula and ancestrular zooecia.

Pleistocene: Mount Hope, Panama Canal Zone.

FIG. 10. *Mastigophora pesanseris* Smitt, 1873. (p. 172.)

Zooecia, × 20.

Pleistocene: Mount Hope, Panama Canal Zone.

FIG. 11. *Rhynchozoon levigatum*, new species. (p. 157.)

Zooecia of the incrusting zoarium, × 20. The salient globular ovicell and the spinule in the peristome are shown.

Pleistocene: Mount Hope, Panama Canal Zone.

FIGS. 12, 13. *Porella costulata*, new species. (p. 150.)

12. Zooecia of the incrusting zoarium, × 20, in the vicinity of the ancestrula.

13. Normal zooecia, × 20, showing the large tremopores and prominent avicularian mucro.

Pleistocene: Mount Hope, Panama Canal Zone.

FIG. 14. *Hippoporella costulata*, new species. (p. 133.)

Portion of the incrusting zoarium, × 20, with zooecia exhibiting areolar pores and costules.

Pleistocene: Mount Hope, Panama Canal Zone.

PLATE 46.

FIG. 1. *Holoporella turrita* Smitt, 1873. (p. 179.)

The fossil example, × 20, referred to this recent species.

Pleistocene: Mount Hope, Panama Canal Zone.

FIG. 2. *Holoporella aviculifera*, new species. (p. 179.)

A portion of the incrusting zoarium, × 20. A small avicularium in the peristome is visible.

Pleistocene: Mount Hope, Panama Canal Zone.

FIGS. 3–6. *Cyclicopora multilamellosa*, new species. (p. 138.)

3. Surface of the free orbicular zoarium, × 20, illustrating the form of the zooecia and ovicell.

4. Zooecia × 20, with a large transverse avicularium.

5. Ordinary zooecia, × 20.

6. Interior of zooecia, × 20. The tremocyst is visible through the very thin olocyst.

Pleistocene Mount Hope, Panama Canal Zone.

FIG. 7. *Holoporella mucronata*, new species. (p. 179.)

The incrusting zoarium, × 20, illustrating the large areolar pores and prominent oral mucro.

Pleistocene: Mount Hope, Panama Canal Zone.

FIGS. 8, 9. *Acanthodesia savartii* forma *texturata* Reuss, 1847. (See also pl. 5, figs. 1–5.) (p. 32.)

Surface of two small unilamellar examples, × 20.

Pleistocene: Vero, Florida.

FIG. 10. *Hemiseptella tuberosa*, new species. (p. 71.)

The incrusting zoarium, × 20, showing the irregular inferior border of the opesium.

Pleistocene: Simmons Bluff, Yonges Island, Charleston County, South Carolina.

FIGS. 11, 12. *Membranipora osburni*, new species. (p. 24.)

11. The incrusting zoarium, × 20, illustrating the thin, rounded mural rim, the tubercles, and the small, concave proximal cryptocyst.

Pleistocene: Mount Hope, Panama Canal Zone.

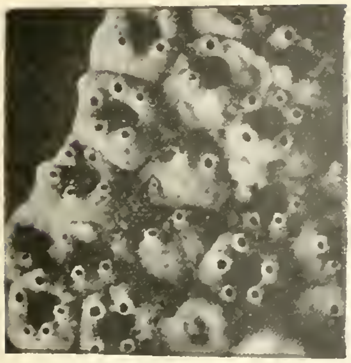
12. Ancestrular region of a zoarium, × 20, referred to this species.

Miocene (Bowden marl): Bowden, Jamaica.

FIG. 13. *Terebripora pacifica*, new species. (p. 15.)

The type specimen, × 10, showing the small pyriform zooecia separated by one to two times their length.

Pleistocene: Santa Barbara, California.



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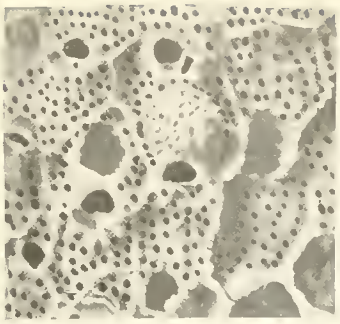

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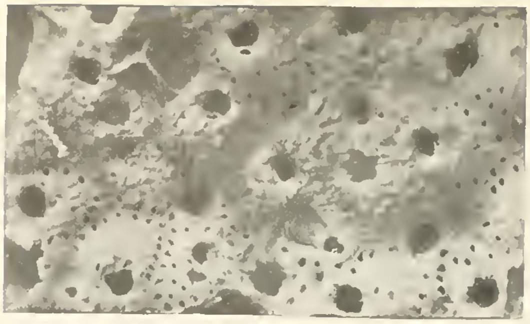

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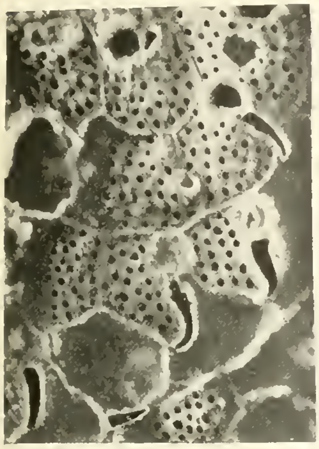

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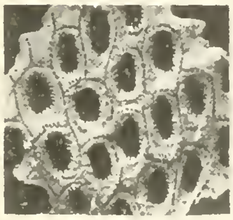

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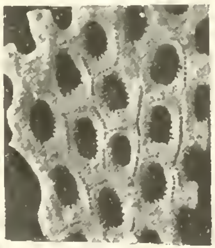

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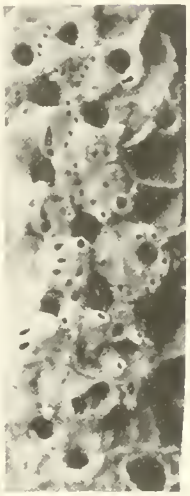

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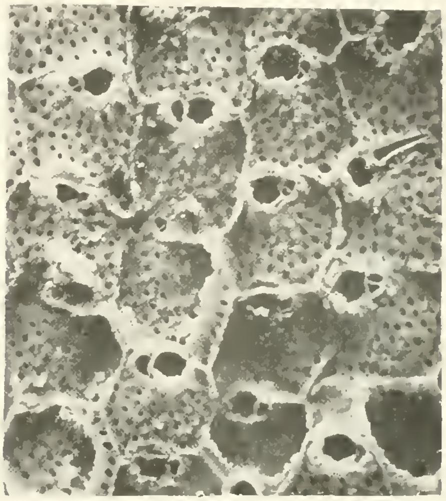

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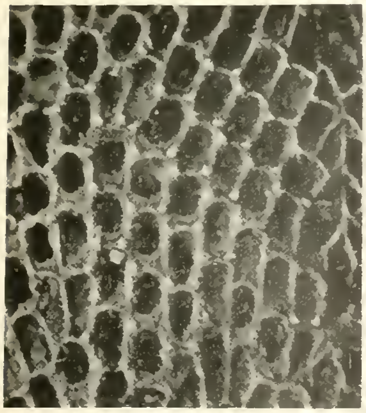

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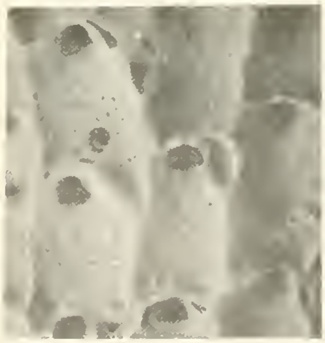

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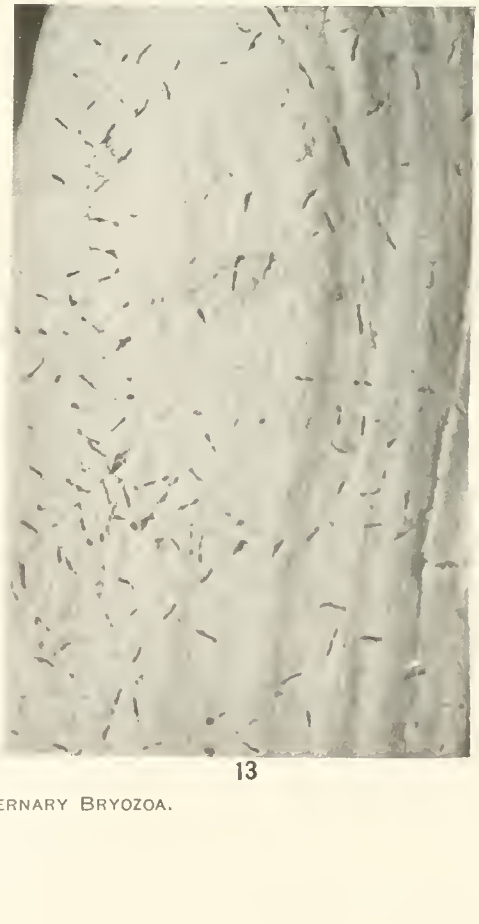

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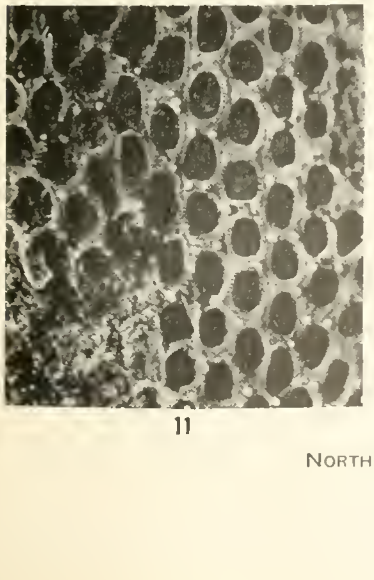

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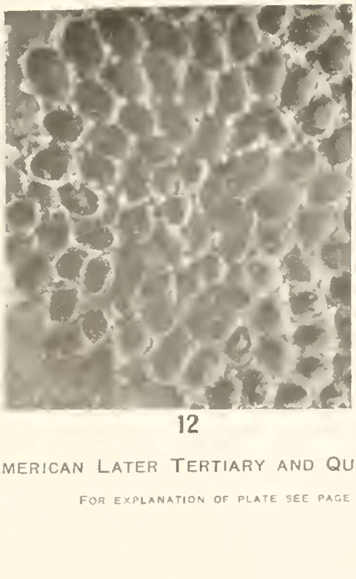

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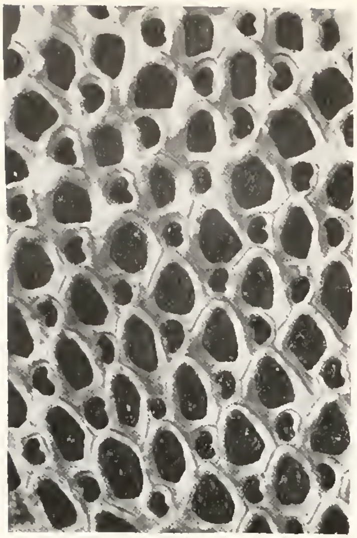
North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 290.



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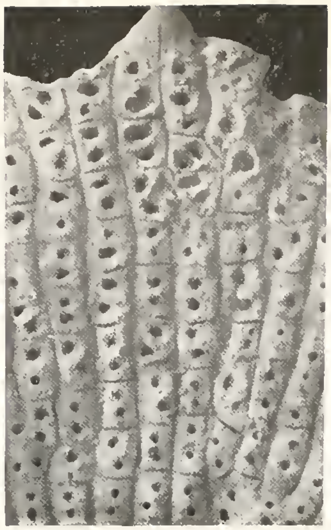

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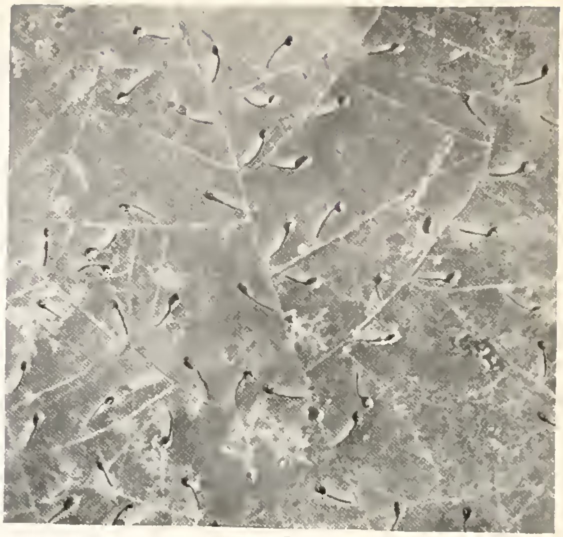

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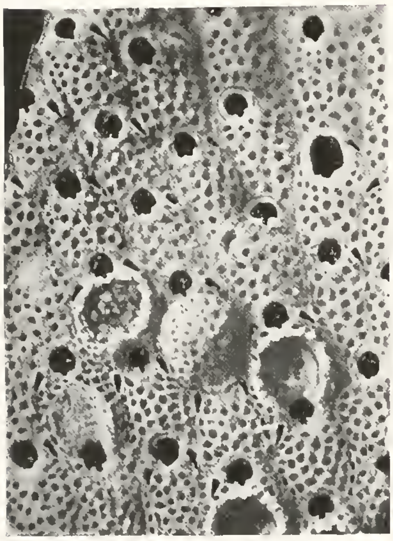

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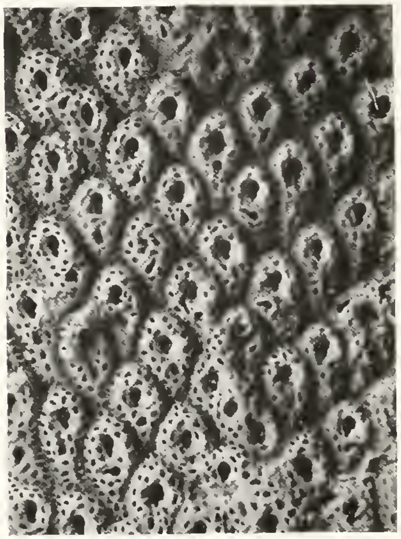

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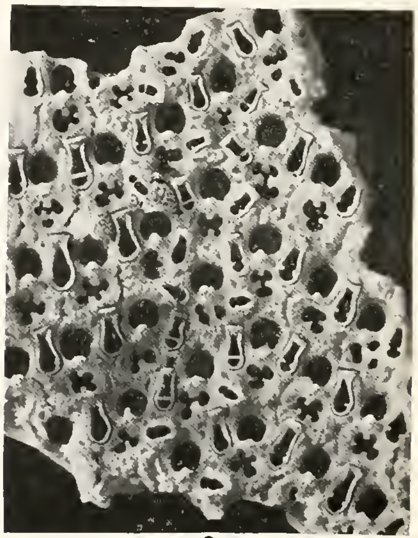

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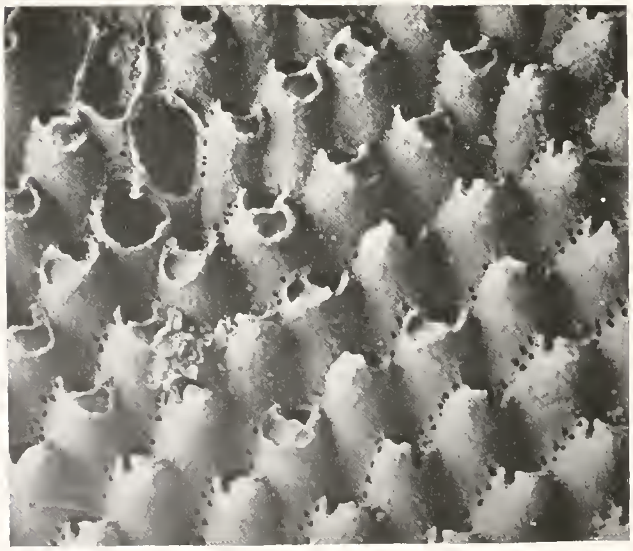

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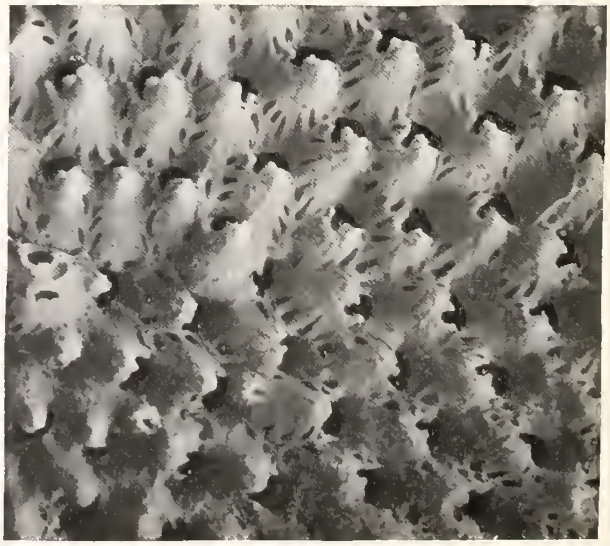

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North American Later Tertiary and Quaternary Bryozoa.

For explanation of plate see page 291.

PLATE 47.

FIGS. 1, 2. *Cupuladria biporosa*, new species. (p. 29.)

1. Celluliferous surface of the orbicular zoarium, × 20, showing the wide zooecia and the large auriculate vibracula.

2. Inner face of the same zoarium, × 20, with the characteristics two pores to each zooecium.

Lower Miocene (Bowden horizon): Santo Domingo.

FIG. 3. *Spathipora longirima*, new species. (p. 16.)

A portion of the type specimen, × 20, illustrating the delicate canalicules with the attached zooecia, the apertures of which bear a long rimule.

Pliocene (Waccamaw marl): Waccamaw River, South Carolina.

FIG. 4. *Stylopoma magniporosa*, new species. (p. 103.)

Surface of the bilamellar zoarium × 20. The large tremopores, the avicularia, and the ovicell hiding the aperture are apparent.

Lower Miocene (Bowden horizon): Santo Domingo.

FIG. 5. *Laminopora miocenica*, new species. (p. 160.)

Zooecial surface, × 20, with the parietal dietellae, tremopores, elongate oval zooecia, and long rimule visible.

Lower Miocene (Bowden horizon): Santo Domingo.

FIG. 6. *Tremogasterina truncatorostris*, new species. (p. 244.)

The bilamellar zoarium, × 20, with the truncated avicularium and the large trifoliate fronta pore well preserved.

Lower Miocene (Bowden horizon): Santo Domingo.

FIGS. 7, 8. *Rhynchozoon grandicella*, new species. (p. 156.)

7. Marginal zooecia of the incrusting zoarium, × 20, showing the pleurocyst frontal with small areolar pores and the prominent avicularian chamber.

8. Ancestrular zooecia, × 20, with the costules of the frontal better developed.

Pleistocene: Rustic Canyon, Santa Monica, California.

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